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HORNSTEIN (I.), REYNOLDS (H.) & GILPIN (G. L.). **Benzene Hexachloride Content and Flavor of Peanuts grown in Rotation with Cotton dusted with this Insecticide.**—*Agric. Fd. Chem.* **2** no. 15 pp. 776–778, 8 refs. Easton, Pa., 1954.

As treatment of cotton with unusually heavy applications of dusts prepared from technical BHC has been shown to affect the flavour of groundnuts subsequently grown in the soil, the effect of dusts prepared from BHC containing an increased proportion (36 per cent.) of the γ isomer was tested in 1951. Cotton in South Carolina was dusted 4–16 times, beginning in May, with a mixture containing 3·08 per cent. γ BHC, 5·25 per cent. other isomers and 91·67 per cent. diluent, soil samples were taken in the spring of 1952, before the groundnuts were planted, and at harvest, and groundnut butter prepared from the crop was analysed for BHC and tasted.

The analytical method was sensitive to as little as 0·1 part per million BHC in the soil and 0·2 p.p.m. in groundnut butter, and only one of the soil samples and none of the groundnut-butter samples contained more than these quantities. There was very little criticism of flavour, and it is concluded that even at the highest rate of application used, which totalled 5·1 lb. γ isomer and 14 lb. total isomers per acre, there was no evidence of insecticide accumulation in soil or harvested product or of such flavour defects as occurred in earlier tests, in which 5·1 lb. γ isomer and 41·1 lb. total isomers were applied per acre.

DÜRR (H. J. R.). **The European House Borer** *Hylotrupes bajulus* **(L.) (Coleoptera: Cerambycidae), and its Control in the western Cape Province.**—*Bull. Dep. Agric. S. Afr.* no. 337, [3+] 78 pp., 6 figs., 1 map. Pretoria, 1954.

In view of the increasing importance of *Hylotrupes bajulus* (L.) as a pest of timber in buildings in South Africa [*cf. R.A.E.*, A **34** 12], investigations on its bionomics, the possibilities of spread from the coastal areas, to which it is at present confined, and control were made during 1943–49. A detailed account is given of the work, together with information, much of it from the literature, on the economic importance of the beetle elsewhere, its systematic position and world distribution, the timbers attacked, methods of control, and the morphology of the adults and larva. In South Africa, the beetle is confined mainly to Port Elizabeth and the coastal regions of the western Cape Province, where it is especially well established in forest débris, pine fences and buildings in the southern suburbs of the Cape Peninsula. Its distribution may be limited by climatic conditions and breeding facilities, but larvae in experimental wooden blocks completed their development in four years under natural conditions at Pretoria [*cf.* **39** 146], and it is probable that the Cerambycid was introduced independently into two different centres and is spreading from each.

In feeding tests, larvae completed their development in blocks of *Pinus radiata* (*insignis*), *P. pinaster* and *P. sylvestris*; they fed on *P. palustris*, *P. pinea*, *Picea sitchensis* and *Pseudotsuga taxifolia*, but not on *Pinus strobus*, *Cupressus* sp., *Podocarpus* sp., oak or poplar. In buildings, roof timbers are most frequently attacked, though other portions are also damaged, and electric power cable drums and telegraph poles have been severely injured. Studies of the factors influencing susceptibility of timber to attack, especially in roofs, showed that it decreases with age subsequent to felling. Contrary to experience in Europe, where timbers under metal roofs are most frequently damaged [*cf.* **23** 684; **29** 324], infestation was commonest under tiled roofs [*cf.* **34** 12]; the very high temperatures that

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develop beneath metal roofs in South Africa are probably lethal to the eggs. Roof timbers over 20 years of age were rarely attacked [*cf.* **26** 91; **29** 324]. Infestation is confined to the sapwood, and timbers such as *Pseudotsuga taxifolia*, which have little sapwood, are not severely damaged. Timbers that have lost a considerable amount of the essential oils (pinenes) that attract the ovipositing females are seldom attacked; the relative amounts of resins and lignin, which are harmful to the larvae, and the amounts of protein, sugars and mineral salts, which favour them, also influence susceptibility.

Investigations on the value of wood preservatives and insecticides for control [*cf.* **40** 316] were begun in 1943–44. A method for the estimation of small quantities of pentachlorophenol in wood was devised, and it was found that the rate of penetration of pentachlorophenol into pine timber was rapid during the first two minutes and subsequently slower. In tests with small wooden blocks treated with various materials, none repelled the ovipositing females, but some, notably DDT and BHC, killed them so rapidly that most were unable to oviposit. The viability of eggs laid under blocks treated with pentachlorophenol, zinc sulphate, Wolman salts [*cf.* **37** 282; **38** 261] or copper naphthenate was significantly lower than that of eggs under untreated wood, with no significant differences between materials. When young larvae were placed under treated wooden blocks and examined for mortality a week later, creosote, DDT, BHC and pentachlorophenol, the last in mineral turpentine (white spirit) or castor oil, all of which have strong contact action, were in general significantly more toxic than Wolman salts, zinc sulphate or copper naphthenate, though pentachlorophenol in castor oil did not differ significantly from zinc sulphate; Wolman salts were significantly more toxic than zinc sulphate and copper naphthenate, in both of which contact action was very weak. The addition of castor oil to pentachlorophenol reduced its rate of action, evidently by preventing or reducing the formation of crystals on the treated surface. In further tests, a solution of 5 per cent. pentachlorophenol was significantly more effective than zinc naphthenate or copper naphthenate at the same concentration or a mixture of 2 per cent. pentachlorophenol with 3 per cent. zinc naphthenate, but not significantly more toxic than a mixture of 3 per cent. pentachlorophenol and 5 per cent. zinc naphthenate. Treatment of pine blocks with zinc sulphate, pentachlorophenol, DDT, BHC or copper naphthenate, all at 5 per cent., Wolman salts at 1·25 per cent. or creosote did not prevent feeding by young larvae subsequently introduced into them, but all except zinc sulphate and pentachlorophenol, absorption of which was insufficient [*cf.* **39** 146], gave complete mortality in 11 months. In a further test, 5 per cent. copper naphthenate gave higher mortalities of the larvae in 28 days than zinc naphthenate at the same concentration, and the latter was significantly more effective than 5 per cent. pentachlorophenol. A mixture of 3 per cent. zinc naphthenate and 2 per cent. pentachlorophenol was more toxic than 5 per cent. pentachlorophenol alone, and one of 5 per cent. zinc naphthenate and 3 per cent. pentachlorophenol appeared still more so, though the difference was not significant. The most rapid mortality was given by 1 per cent. zinc sulphate or Wolman salts. When pine blocks were dipped in solutions of 5 per cent. BHC or DDT and subsequently stored under room conditions, BHC was still toxic to the larvae after three years, but DDT gave inconclusive results; about 0·2 lb. p,p′DDT per cu. ft. remained in the wood.

In further tests, complete mortality of larvae in wood was given by fumigation with methyl bromide at 2 lb. per 1,000 cu. ft. space for 12 hours at atmospheric pressure or for two hours under a vacuum of 20–15 ins. mercury. This method is of value for furniture and structures that cannot

be treated with wood preservatives; unpolished or unvarnished surfaces can subsequently be protected by treatment with 5 per cent. pentachlorophenol, which is especially recommended for this purpose and for treating roof and floor timbers because of its chemical stability, non-staining and rapid drying properties and rapid contact action.

On the basis of the work it is concluded that the most suitable materials for use in treatments against *H. bajulus* are 5 per cent. zinc naphthenate or a mixture of 3 per cent. zinc naphthenate and 2 per cent. pentachlorophenol, both in power kerosene. It is stated in a footnote, however, that white spirit alone or mixed with equal quantities of power kerosene has been shown to provide a superior solvent for metallic naphthenates, especially if the wood is subsequently to be painted.

Perold (R. P.). **Apparatus for Soil Fumigation.**—*Sci. Bull. Dep. Agric. S. Afr.* no. 357, [1 +] 15 pp., 15 figs., 1 ref. Pretoria, 1955.

Various types of apparatus for the application of liquid fumigants to large areas of soil against insects and other pests are described, and the results of recent tests of their performance in South Africa are recorded.

Linser (H.) & Beck (W.). **Über ein Vorkommen parasitischer Würmer beim Kartoffelkäfer in Oberösterreich.** [An Occurrence of Parasitic Worms in the Potato Beetle in Upper Austria.]—*Anz. Schädlingsk.* **28** pt. 2 pp. 20–21, 3 figs., 1 ref. Berlin, 1955.

Unidentified worms, probably representing a species of *Mermis* or possibly *Gordius*, were found infesting larvae of *Leptinotarsa decemlineata* (Say) in several localities in Upper Austria in the summer of 1954, when the weather had been cool and wet. Of 100 larvae collected on 27th July and kept with potato foliage and sieved soil, 70 had died from the attack by 1st August and only five pupated and gave rise to adults, which were not infested.

Allen (N.) & others. **Persistence of BHC, DDT, and Toxaphene in Soil and the Tolerances of certain Crops to their Residues.**—*Tech. Bull. U.S. Dep. Agric.* no. 1090, 19 pp., 10 figs., 23 refs. Washington, D.C., 1954.

The following is virtually the authors' summary. A plant-tolerance experiment was initiated at Florence, South Carolina, in 1947. DDT, BHC and toxaphene were incorporated in the top 6 ins. of the soil, and studies were made to determine their effect on tobacco, cotton and cowpeas grown in a typical three-year rotation. DDT was applied at 10 and 20 lb. per acre each spring from 1947 to 1951, and at 40 and 100 lb. in 1947 only; BHC at 16·7 lb. each spring and at 83·3 lb. in 1947 only; BHC at 12·5 lb. with 2·5 lb. DDT each spring and at 50 lb. with 10 lb. DDT in 1947 only; and toxaphene at 20 lb. per acre each year. The tobacco was followed by a winter cover crop of oats and Austrian winter peas, and the cotton and cowpeas were followed by rye. Soil samples were taken from the plots at the end of the fourth year and again at the end of the fifth summer-crop season, and chemical analyses made to determine the quantities of the insecticides that remained in the soil and their relation to certain crop yields.

Four and a half years after single applications, approximately 38 per cent. of the DDT and 6 per cent. of the BHC remained in the soil. Six months

after the last of the five annual applications, 53 per cent. of the DDT, 52 per cent. of the toxaphene and 8 per cent. of the BHC remained. Approximately 87 per cent. of the DDT found was in the top 6 ins. of the soil.

There appeared to be a definite relation between the amount of DDT in the soil and the stand, growth and yield of cowpeas, oats and rye. In general, the greater the residue within the ranges found, the poorer were the stand and growth and the lower the yield. This was true for all treatments except the 40-lb. dosage applied in 1947 only, which did not harm any of the test crops. On the other hand, a 10-lb. dosage repeated annually for four years harmed some of the test crops. The yield of saleable tobacco was reduced by the two heaviest dosages of DDT, but the lightest dosage did not cause any adverse effects. The yield of cotton did not appear to be affected by the quantity of DDT in the soil. The BHC residues in the soil were light for all treatments. All dosages tested appeared to increase the yield of tobacco in 1951, but this increase was due, in part at least, to some reduction in the severity of attack by nematodes. Although there was an increase in the yield of tobacco, cigarettes made from it had an undesirable flavour and aroma. Cotton did not seem to be affected by BHC. The yields of cowpea hay, peas in the hull, and the winter cover crops were higher and the BHC residues in the soil were lower where this insecticide alone or in combination with DDT was applied in 1947 only.

The plots treated with a mixture of BHC and DDT in 1947 only produced more cowpea hay and peas in the hull in 1951, and all types of winter cover crops studied in 1951–52 yielded more than the control plots. It is doubtful, however, whether the quantity of BHC that remained in the soil was responsible for the differences. In general, BHC increased the yield of cowpeas every year, but an explanation for this was not found.

Toxaphene in the soil did not appear to be toxic to tobacco, cotton, or cowpeas. However, cigarettes made from the tobacco were inferior in flavour and aroma to those from tobacco grown on control plots. This treatment reduced the stand and lowered the yields of oats and rye.

McLeod (J. H.). **Notes on the Cabbage Seedpod Weevil,** *Ceutorhynchus assimilis* **(Payk.) (Coleoptera: Curculionidae), and its Parasites.**—*Proc. ent. Soc. B.C.* **49** (1952) pp. 11–18, 6 figs., 9 refs. Vernon, B.C., 1953.

Ceuthorrhynchus assimilis (Payk.) was first reported in British Columbia in 1931, and became the most important pest of cruciferous seed crops there after about 1940 [*cf. R.A.E.*, A **35** 34], when the area devoted to these was increased. Infestation had virtually disappeared by 1945 on the mainland, but it remained high on Vancouver Island. In studies of the distribution, incidence and parasitism of the weevil in 1949–51, *C. assimilis* was collected from seed crops of cabbage, cauliflower, brussels sprouts and swedes, from radish growing as an escape, and from the wild *Brassica campestris* and *B. juncea*. These two weeds are widely distributed and remain green until October, whereas the crop plants become unsuitable for larval feeding after July, so that they provide a source from which the cultivated crops become infested. During the years under review, the infestation percentages among collections of seed pods of cabbage from Vancouver Island and turnip from the Fraser Valley, on the mainland, varied from 55·9 to 94·7 and from 30·7 to 62·3, respectively. In heavily infested fields, the percentage of pods with two or more larvae was high, and whereas the reduction in seed yield was only 10 per cent. where pod infestation was 30 per cent., it increased to about 40 per cent. where infestation was 80 per cent.

The weevil became important on crucifers in the western United States at about the same time as in British Columbia, and a list is given of 12 parasites

that attack it on the Pacific coast, showing which occur in British Columbia, Washington and California, the data for the last two areas being based on papers already noticed [**34** 76; **40** 111]. Seven occur in British Columbia. *Trichomalus fasciatus* Thoms., which occurs in all three areas, was the most important in British Columbia, where it comprised 94·1 and 85·9 per cent. of all the parasites obtained in 1950 and 1951, respectively; it may have been introduced from Europe with its host. In the laboratory, adult emergence continued from 11th July until 10th October, but whereas adults that emerged in July and early August died within three weeks, those that emerged after 15th August remained active until October, when they entered cracks in the cage and overwintered. There are probably two generations a year. *Habrocytus* sp. was reared from *C. assimilis* in British Columbia and Washington, and 183 adults of an unidentified species of the same genus from Europe were released in British Columbia in July 1949. No recoveries were made during 1950–51, and it is not known whether the introduced species was identical with the one already present. An unidentified species of *Bracon*, believed to be indigenous, was found in numbers in 1943 on the mainland, where *C. assimilis* was less abundant and more heavily parasitised than on Vancouver Island. As it had not been obtained from Vancouver Island, 1,241 adults were released there in the springs of 1944, 1945 and 1946; small numbers have been recovered since 1949. Of the other species present in British Columbia, *Necremnus duplicatus* Gah. is one of the most important there and in Washington, *Eupelmella vesicularis* (Retz.) was reared from *Hylemyia* sp. on lupin as well as from *C. assimilis*, and *Eurytoma* sp. and *Zatropis* sp. are of little significance. This parasite complex causes a highly significant reduction in injury by *C. assimilis*; the number of swede seeds destroyed per larva in a field in which pod infestation was 39·7 per cent. and total parasitism 79·8 per cent. was estimated at 2·6, whereas in another field in which infestation was 87·9 per cent. and total parasitism 9·4 per cent., it was 4·7. Although many of the host larvae are not attacked until they reach the later instars, their feeding period is shortened considerably and populations are reduced in the following year.

Downing (R. S.). **Preliminary Orchard Trials with systemic Insecticides.** —*Proc. ent. Soc. B.C.* **49** (1952) pp. 24–26. Vernon, B.C., 1953.

Systemic insecticides were tested against mites on apple in British Columbia in 1950–51. Unless otherwise stated, the sprays were applied at the pink-bud stage, and they were usually compared with one of 1 lb. 15 per cent. wettable parathion per 100 gals., which is the recommended treatment; all spray quantities are given per 100 gals. In a test against *Metatetranychus ulmi* (Koch) in 1950, the seasonal average number of mites per leaf was 0·6 on trees sprayed with Pestox 3 (30 per cent. schradan) at 1 quart and 0·2 for parathion, whereas there were 14·8 mites per leaf in late May on untreated trees. When applied against *Tetranychus telarius* (L.) (*bimaculatus* Harvey), Systox (32·1 per cent. diethyl 2-(ethylmercapto)ethyl thiophosphate [demeton]) applied at 0·25 pint on 27th August reduced the number of mites per leaf from 24·3 before spraying to 0·3 on 1st September, and parathion reduced it from 23·6 to 0·2. In both cases, the number had increased to 0·9 by 9th September. The corresponding figures for untreated leaves were 13, 10·6 and 4·8. In 1951, sprays containing 1 quart 45 per cent. schradan and 0·25 pint 50 per cent. Systox kept the leaves free from infestation by *Bryobia praetiosa* Koch until 4th July and 9th August, respectively, whereas the parathion spray permitted slight infestation by 21st June; on 9th August, the average numbers of mites per leaf were 0·6, 0·6 and 12·8 for the three treatments, respectively, and there were 8·4 on untreated

trees on 4th July, when spraying became necessary. Schradan caused slight marginal injury to the leaves. In another orchard, the Systox and parathion sprays prevented the number from rising above 0·3 and 4, respectively, by 7th August, when it was 19·1 on trees sprayed with Aramite (15 per cent. 2-chloroethyl 2-(p-tert.-butylphenoxy)-1-methylethyl sulphite) at 2 lb. In tests of treatments against overwintered females of *Eotetranychus carpini* (Oudm.) (*flavus* (Ewing)) that had begun ovipositing, the Systox spray protected the leaves from infestation until September, when 14 per cent. on trees sprayed with Aramite and 92 per cent. on those not treated were infested. All plots except those sprayed with Systox were heavily infested by *Eriosoma lanigerum* (Hsm.) and *Aphis pomi* Deg. Apples from trees of two varieties that were sprayed at the pink-bud stage with Systox at 1 quart per acre were found to contain 1·8 and less than 0·2 parts pure Systox per million at harvest.

Thomson (H. M.). *Perezia fumiferanae* **n.sp., a new Species of Microsporidia from the Spruce Budworm** *Choristoneura fumiferana* **(Clem.).** —*J. Parasit.* **41** no. 4 pp. 416–423, 2 figs., 8 refs. Lancaster, Pa., 1955.

Surveys of the pathogens attacking *Choristoneura fumiferana* (Clem.) on spruce and balsam fir [*Abies balsamea*] in Ontario showed that the larvae were infected with Microsporidia to varying degrees throughout the Province. Laboratory studies on the life-cycle of these protozoa, which are described, showed that they were referable to the genus *Perezia*, and the name *P. fumiferanae*, sp.n., is proposed for them. Among laboratory-reared larvae, the principal site of infection was the cells of the midgut, but other tissues were also infected in field-collected larvae. Young larvae died within 7–8 days after infection in the laboratory, but larvae in the fifth and sixth instars were sometimes able to survive extremely heavy infections. A table is included in which the characteristics of *P. fumiferanae* are compared with those of the six other known species of *Perezia*, of which five were described from insects [*cf. R.A.E.*, A **6** 177, 190; **12** 337; **15** 655]. In a subsidiary test, spores of *P. pyraustae* from Iowa [*cf.* **41** 114] were not infective for larvae of *C. fumiferana*.

Barlow (H. W. B.), Dicker (G. H. L.) & Briggs (J. B.). **Studies on Control of Apple Sawfly,** *Hoplocampa testudinea* **(Klug). II. Effect of Sprays on Fruit Drop and Yield.**—*42nd Rep. E. Malling Res. Sta. 1953–54* pp. 107–114, 2 graphs, 6 refs. East Malling, 1955.

The authors summarise the results of experiments in south-eastern England in 1949–51 on the effectiveness of sprays of parathion, γ BHC and nicotine against *Hoplocampa testudinea* (Klug) on apple [*R.A.E.*, A **42** 191] and give those obtained in a further test in 1953. Infestation in that year was heavy, and 0·0075 per cent. parathion and 0·006 per cent. γ BHC gave 83–93 per cent. reduction of infestation in petal-fall applications and considerably less when applied 12 days later.

Since parathion appeared to affect the dropping of the fruits, observations on fruit drop were made each year. It is concluded that only parathion had a marked effect on it, and that this effect was not associated with control of the sawfly; applications made up to ten days after petal-fall appeared to reduce fruit drop and those 10–15 days after to increase it, but it is suggested that parathion always increases shedding within ten days of application, the apparent decrease from early applications being a reaction from an earlier high increase that it was not practicable to record.

The effects of the sprays on the final yields are also considered: the only

treatments resulting in increases were some of the applications of parathion in each year and some of those of γ BHC in 1953. The addition of α-naphthaleneacetic acid to parathion in 1950 [*cf. loc. cit.*] resulted in reductions in yield. The yield increases could not be explained by sawfly control, and their cause was not determined.

Chant (D. A.) & Muir (R. C.). **A Comparison of the Imprint and Brushing Machine Methods for estimating the Numbers of Fruit Tree Red Spider Mite, *Metatetranychus ulmi* (Koch), on Apple Leaves.**—*42nd Rep. E. Malling Res. Sta. 1953–54* pp. 141–145, 1 fig., 4 refs. East Malling, 1955.

Investigations were carried out in July and August 1954 in which the numbers of *Metatetranychus ulmi* (Koch) on samples of 16 apple leaves were estimated by crushing the mites between sheets of paper and counting the stains [*cf. R.A.E.*, A **30** 134] or by brushing them off the leaves in a machine on to glass plates and counting them under a microscope [*cf.* **31** 471]. The results showed that the first method missed 19·8–25·6 per cent. of the eggs and active stages, those near the midrib not being crushed, and the second 2·7–5·1 per cent. Brushing does not damage the eggs or mites and is about as rapid as the imprint method; it is therefore considered preferable, but it appears that even when this method is used, samples of 16 leaves may be inadequate for accurate studies.

Groves (J. R.). **A Comparison of Bait and Light Traps for catching Codling Moths, *Cydia pomonella* (L.).**—*42nd Rep. E. Malling Res. Sta. 1953–54* pp. 146–148, 2 graphs, 4 refs. East Malling, 1955.

Bait-traps containing 10 per cent. solutions of molasses [*cf. R.A.E.*, A **36** 132] in 1949 and molasses, treacle or syrup in 1950–52 were used to facilitate the timing of sprays against *Cydia pomonella* (L.) on apple in south-eastern England, but did not prove entirely satisfactory [*cf.* **29** 435]; treacle appeared to be more and syrup less attractive than molasses in two of the years in which they were compared. In 1951 and 1952, light-traps of the Robinson design [*cf.* **43** 169], with an 80-watt mercury-vapour lamp and tetrachloroethane vaporised inside the trap to anaesthetise the moths, were also used. They proved easier to operate than the bait-traps and more effective at low population densities, but were slightly less efficient in full moonlight than in the dark and attracted large numbers of other moths, which sometimes complicated sorting.

Normally about half the moths that develop from larvae collected in the field are females, but females represented 76 and 27 per cent. of the moths caught in bait-traps and light-traps, respectively. It is shown that *C. pomonella* has a flight period of 14–15 weeks in the area concerned, reaching a peak at different times in different seasons, and the moths are mainly of one generation, though a few of the following generation occur during the last 3–4 weeks.

Collyer (E.). **Notes on the Biology of some predacious Mites on Fruit Trees in south-eastern England.**—*Bull. ent. Res.* **47** pt. 2 pp. 205–214. 3 graphs, 22 refs. London, 1956.

The following is largely based on the author's summary. A survey of predacious mites found, mainly in association with orchards, in south-eastern England showed that those present were *Typhlodromus tiliae* Oudm., *T. cucumeris* Oudm., *T. tiliarum* Oudm., *T. rhenanus* (Oudm.), *T. finlandicus*

(Oudm.), *T. umbraticus* Chant, *T. masseei* Nesbitt, *T. vitis* Oudm., *T. soleiger* (Ribaga), *Phytoseius macropilis* (Banks) and two undetermined species of *Amblyseius*. The plants on which each was observed are shown, and certain measurements and other characters of value in separating the species are given. *T. tiliae*, *T. finlandicus* and *P. macropilis* were normally abundant on unsprayed apple trees [*cf. R.A.E.*, A **42** 130], but only *T. tiliae* was common on sprayed ones. Laboratory studies indicated that the mites normally produce three generations a year, and this was confirmed by observations on field populations. The overwintered females begin to oviposit in late April, but eggs are not numerous until May or early June. In *T. tiliae*, the duration of the egg stage varied from a minimum of two days during July–August to a maximum of ten in April, and the nymphal stage lasted 9–14 days. The adult females usually survived for about 20–30 days, the pre-oviposition period was sometimes as long as 14 days, and eggs were laid at an average rate of one per day. On fruit trees, the mites feed on *Metatetranychus ulmi* (Koch), *Tetranychus telarius* (L.), *Eotetranychus carpini* (Oudm.) and *Bryobia praetiosa* Koch. When adults of *M. ulmi* were supplied in the laboratory, nymphs and adults of *Typhlodromus tiliae* consumed averages of two and three, respectively, per day; ovipositing females consumed as many as five per day. It is thought that the mites also feed on plant tissues, since individuals survived in the laboratory for considerable periods on plant food in the absence of phytophagous species, though they did not oviposit.

Fletcher (D. S.). *Spodoptera mauritia* (**Boisduval**) **and** *S. triturata* (**Walker**), **two distinct Species.**—*Bull. ent. Res.* **47** pt. 2 pp. 215–217, 1 pl. London, 1956.

Examination of adults of *Spodoptera mauritia* (Boisd.) from the Solomon Islands and of specimens in the British Museum showed that two species have been confused under this name, the true *S. mauritia*, which occurs in Madagascar, Mauritius and the Comoro Islands and from India to the Pacific, and is known from Africa from a female taken on the coast of Tanganyika, and *S. triturata* (Wlk.), which occurs throughout continental Africa south of the Sahara. *S. mauritia* has been frequently recorded as a pest of young graminaceous crops in Mauritius and in the Indo-Australian and Pacific regions, and there are two records of it attacking similar plants in Africa; one of them [*R.A.E.*, A **31** 86] was found to refer to *S. cilium* Gn. and the other [**32** 396] to *S. triturata*. Two subspecies of *S. mauritia* are recognised, the typical one, from Mauritius, Madagascar, the Comoro Islands and Tanganyika, and subsp. *acronyctoides* Gn., under which are grouped the populations from the Oriental, Indo-Australian and Pacific regions, further division of these being held unwise at present; the types of both are lost. The adults of both sexes of the typical *mauritia* and their genitalia are described, as also are those of *S. triturata*, and characters are given distinguishing *S. m. acronyctoides* from *S. m. mauritia*; synonyms of all three are shown.

Hanna (A. D.), Judenko (E.) & Heatherington (W.). **The Control of** *Crematogaster* **Ants as a Means of controlling the Mealybugs transmitting the Swollen-shoot Virus Disease of Cacao in the Gold Coast.**—*Bull. ent. Res.* **47** pt. 2 pp. 219–226, 1 pl., 2 refs. London, 1956.

The following is based on the authors' summary. *Pseudococcus njalensis* Laing, the most important of the mealybugs that transmit the virus of

cacao swollen-shoot in the Gold Coast, is almost always attended by ants of the genus *Crematogaster*. These ants usually build their nests in cavities and galleries already excavated by wood-boring insects in the dead branches of cacao trees and imbibe the honeydew produced by the mealybugs. If the honeydew is allowed to accumulate, it becomes a medium for the development of moulds and bacteria and seems eventually to kill the mealybugs.

An attempt was made to break the link between the mealybugs and ants by spraying six cacao trees, not in contact with each other or any other trees, twice at an interval of a fortnight with an emulsified solution of 0·2 per cent. DDT. All dead branches containing ants' nests were cut out, and a band of adhesive was applied to the trunk, one foot above soil level, to prevent the ants from climbing up. Four weeks after the first spray, the mealybug population was reduced to 1·2 per cent. of its original size. Since detection of the nests, especially those in crevices and under the bark, is difficult, the value of spraying the trees without first eliminating all the sources of ants was tested. The results were unsatisfactory, since the mealybug population, though initially reduced, had reached 92·3 per cent. of its original size after eight weeks when the spray contained DDT alone, and 58·8 per cent. of it when 0·02 per cent. parathion was added. Cutting off the dead branches containing ants' nests, followed by either painting the cut ends of the dead branches with an emulsified solution of 16·7 per cent. DDT or painting the trunk with a band of the same also gave poor results. In a further test, the effectiveness of dimefox [bis(dimethylamino) fluorophosphine oxide] applied to the soil at 0·8 gm. active material per inch of tree girth [*cf. R.A.E.*, A **44** 6] was not increased by partly eliminating the ants. As treated cacao trees could not in practice be completely isolated from forest trees and climbers containing nests of *Crematogaster*, which provide a continuous source of ants, the complete elimination of the latter is not possible. Cacao trees were usually free from mealybugs if no ants were found on them, and the examination of isolated trees with dead branches of different sizes containing ants' nests indicated that the number of mealybugs per tree varies with the size of the nests.

De Lotto (G.). **The Identity of some East African Species of *Saissetia* (Homoptera, Coccidae).**—*Bull. ent. Res.* **47** pt. 2 pp. 239–249, 3 figs., 17 refs. London, 1956.

The main purpose of this paper is to settle the identity of certain species of *Saissetia* that are rather common, sometimes even on cultivated plants, in East Africa, but have been little recorded since their discovery. A key is given differentiating the seven species dealt with, followed by a list showing their distribution and food-plants, and descriptions of the adults of three. One of these is *S. pterolobina*, sp.n., which was found on *Pterolobium lacerans* in Kenya. *S. cuneiformis* Leon. [*cf. R.A.E.*, A **2** 346; **19** 412, 413; **27** 503] is shown to be a synonym of *S. nigra* (Nietn.). The species recorded from coffee are *S. coffeae* (Wlk.) (*hemisphaerica* (Targ.)) in Kenya and Uganda and *S. nigra* and *S. oleae* (Bern.) in Kenya.

Hinton (H. E.). **The Larvae of the Species of Tineidae of economic Importance.**—*Bull. ent. Res.* **47** pt. 2 pp. 251–346, 216 figs., 15½ pp. refs. London, 1956.

The following is based on the author's summary. A key is provided for the differentiation of the larvae of 32 species of Tineids, and detailed descriptions are given for 31 of them. These include most of those known to be

of any economic importance, and information on the bionomics and distribution of each is summarised. The larvae of a few species of no known economic importance are included. Most of these are very closely related to species known to be pests. As 21 species that are indigenous in Britain or established there are included, keys and descriptions have now been provided for half the British Tineids. No larvae were available of four species of some economic importance and 12 others of doubtful status as pests; the literature on these is reviewed.

POLLARD (D. G.). **The Control of Chafer Grubs (*Schizonycha* sp., Coleoptera, Melolonthinae) in the Sudan.**—*Bull. ent. Res.* **47** pt. 2 pp. 347–360, 1 fig., 1 map, 10 refs. London, 1956.

An undetermined species of *Schizonycha* is a major pest of *Dolichos lablab*, a leguminous fodder crop, and sorghum, the staple grain crop, in the Gezira area of the Sudan [*cf. R.A.E.*, A **43** 164], where feeding by the larvae reduced yields of *D. lablab* on the Research Farm by about four-fifths between 1946–47 and 1952–53. The adults of this Melolonthid appear during the rains (July–September) and feed on the leaves of *D. lablab* and probably other plants. Larvae were found in the soil round the roots at a mean depth of 17·9 cm. in January; under sorghum, their mean depth was 30·1 cm. in October and 21·5 in November. In the laboratory, they survived starvation for two months prior to pupating. Pupation takes place between December and March in an earthen cell at a mean depth of 15 cm. The adults emerge after about a month, but do not leave the cells until after the hot, dry weather of April–June. Complete development appears to last more than one year, and some larvae present during winter survive the dry season without pupating. Damage to *D. lablab* probably results from heavy oviposition in the sorghum crop preceding it in the rotation. The larvae have also been found at the roots of cotton, on which they are of no importance, and groundnuts, and have caused severe damage to the latter on several occasions both on the Research Farm and in the southern Gezira. There is evidence that where *Schizonycha* larvae and termites are associated with groundnuts, the former initiate the damage and the latter are secondary pests.

In experiments on the value of BHC in protecting *D. lablab* from *Schizonycha* larvae, a dust applied to the soil at 10–40 gm. γ isomer per feddan (1·038 acres) resulted in considerably increased yields, and these were significantly greater where the dust was applied with the seed at sowing than where it was broadcast, and in general significantly greater than where it was applied along the ridges. It was ineffective when applied as a seed dressing [*cf. loc. cit.*]. Population counts showed that the larvae are not killed by BHC, but are repelled by it or prevented from feeding. It did not appear to prevent pupation or adult emergence, or to affect the depth at which pupation took place. The beneficial effect of the improved crop of *D. lablab* was shown in increased yields of cotton grown on the same land in the following year.

SIMMONDS (F. J.). **Superparasitism by *Spalangia drosophilae* Ashm.**—*Bull. ent. Res.* **47** pt. 2 pp. 361–376, 4 figs., 14 refs. London, 1956.

The following is based on the author's summary. The females of some species of parasites can distinguish hosts that have already been parasitised and refrain from ovipositing in them [*cf. R.A.E.*, A **25** 50, 405; **27** 302; **28** 64; **31** 362, 363], and a study was made of the extent to which *Spalangia*

drosophilae Ashm., a parasite of *Oscinella frit* (L.) in Canada [**40** 369], avoids superparasitism of the puparia of *Drosophila melanogaster* Mg. [*cf.* **42** 43] in the laboratory by exercising these two powers, which are termed discrimination and restraint, respectively. Host puparia 0–24 hours after formation were moistened and stuck ¼ in. apart and in groups of 25, 10 or 5 on pieces of paper that were then placed in glass vials (4½ ins. × 1 in.) and exposed to one unmated female or one, two or five mated females of *Spalangia* for 24, 48 or 72 hours. In this way, a wide range was obtained in the parasite-host (P/H) ratio, computed as the ratio of the number of female parasites, multiplied by the number of 24-hour periods for which they were used, to the number of host puparia exposed. Each treatment was replicated ten times, entailing a total of 360 experiments. The sequence of events associated with oviposition consisted of examination of the puparium by the female, stinging, followed sometimes by feeding on the fluid that exuded, and finally, but not invariably, oviposition. At the end of the experiment, the number of eggs present, or the occurrence of stinging only, was recorded for each puparium. The chance of a puparium being attacked was unaffected by its position on the paper, and there was no significant difference between the total number of eggs that mated and unmated females laid under the same conditions.

The results were assessed by comparing the observed distribution of parasite eggs among host puparia with the probable random distribution calculated from a formula that is given. The divergence between these distributions was greatest at the lower P/H values, and very little superparasitism occurred unless the values exceeded 3/25, at which point total parasitism reached about 60–70 per cent. As the P/H value increased, so did the total parasitism and the degree of superparasitism, and the deviation of the observed from the random distribution of eggs diminished, although even when parasitism reached 91–100 per cent., superparasitism was still avoided in 15·6 per cent. of the experiments.

The degree to which females of *Spalangia* can restrain themselves from ovipositing in hosts that have been parasitised was estimated by plotting the percentage of experiments in which restraint was observed to break down against the level of attack, and comparing the distribution of the points so obtained with the curves that would relate these two functions if the power of restraint were to break down when the female was confronted with two, three or four successive puparia that had already been attacked. It is concluded that the assumption that restraint breaks down at about the third successive unsuitable encounter gives the best fit with the observed data.

Contributory evidence that females of *Spalangia* can distinguish parasitised hosts was obtained by direct observation of their behaviour, which indicated that females took an average of about 3½ minutes to examine an unparasitised host before deciding whether to attack or not, but rejected hosts already parasitised in half that time or accepted them only after unduly prolonged examination.

When individual mated females were supplied daily for 16 days with a single puparium, then for three days with 25 puparia, then again for eight days with a single puparium, and finally for eight days with 25 puparia, the number of eggs laid daily was restricted to less than two when only a single host was available, but rose to about 9–11 on the first day on which an excess of hosts was provided and then fell to a normal output. The females thus adapt their egg-laying to some extent to the number of hosts available.

It was hoped that this elucidation of the combination of perfect discrimination but imperfect restraint exhibited by *Spalangia* when ovipositing, together

with the data previously obtained on its biology [*cf.* **42** 43, 327], would make it possible to predict the fluctuations of a population of *Spalangia* in the field and its effect on the natural host, *O. frit*, but the factors involved and their interactions are too complex, particularly when weather effects are considered, and it is concluded that any predictions of population must be deduced empirically from field observations over a number of years.

JEPSON (W. F.). **The Biology and Control of the Sugar-cane Chafer Beetles in Tanganyika.**—*Bull. ent. Res.* **47** pt. 2 pp. 377–397, 6 figs., 6 refs. London, 1956.

The Melolonthid, *Cochliotis melolonthoides* (Gerst.), the adult and larva of which are described, and which is now the principal pest of sugar-cane in northern Tanganyika, was formerly uncommon and confined to wooded mountain slopes. It was first observed attacking the crop in April 1941, when about 25 acres on a large estate near Moshi were found to be infested. It subsequently spread [*cf. R.A.E.*, A **33** 85] and had covered the whole estate by 1954. Field observations showed that several other Lamellicorns, of which the most important is *Anomala exitialis* Pér., occur in association with it, and systematic and other characters differentiating them are given. Infestation by *C. melolonthoides*, which spreads, builds up and subsides slowly, tends to be heaviest near the irrigation channels. The larvae attack both ratoon and plant cane; evidence of root injury first becomes apparent in July and patches of plants in which growth is stunted, the leaves curled and yellow and the roots severed, appear by September–October if infestation is heavy. In young plantations, both roots and young shoots are eaten and the setts hollowed, and yields from plant and ratoon cane are reduced from 45–80 and 30 tons per acre, respectively, to less than ten; the ratoon crop is completely destroyed after one or two years.

A two-year study of the bionomics of the beetle showed that it has one generation a year, with the main adult flight from early October till the end of November and a subsidiary one in March. The egg stage lasts about 15 days, and eggs and young larvae are abundant from December onwards. First- and second-instar larvae comprised 80 per cent. of the soil population in April 1944, and the third-instar larvae were most abundant and injurious during June–August. Pupation takes place in the soil at depths of 1½–3 ft. or in the woody tissues of the cane stool, which are mined by the older larvae, and the adults emerge after about 14 weeks; larvae that are not fully fed by August give rise to adults in March. No evidence of adult feeding was seen. The control factors that affect each stage, with the estimated mortality for which they are responsible, are shown in a table; the most important are drought, insect and other enemies, and cannibalism. No visible damage occurs until the larval population reaches 8,000 per acre; at 8,000–20,000 per acre, patches of yellow cane appeared, and populations of 20,000–100,000 per acre caused complete destruction of the stools. Reasonable yields were obtained from severely infested fields that were abandoned for two years before being replanted.

Cultural control measures suggested comprise the deferment of planting until July–October, when larval activity has lessened; the use of quick-maturing and high-yielding varieties of cane, with improved mechanical cultivation, which should reduce the ratooning period from 8–10 years to three, after which a quick-maturing green-manure crop can be grown; and a lowering of the water-table by the control of irrigation. Resistant varieties, of which three have been introduced, should be investigated. A list is given of various parasites and predators that were observed or are thought to attack *C. melolonthoides* in Tanganyika, with some that attack related

species elsewhere and appear suitable for introduction. The chief native parasite of the larvae, *Campsomeris mansueta* (Gerst.), increased in numbers when cotton was included in the rotation [*loc. cit.*], especially where *Vigna* sp. and haricot beans were sown among it, to provide flowers attractive to the adults, and a native species of *Stachytarpheta* was subsequently used for the same purpose.

In tests on chemical control, which are described, treatment of the setts with BHC or DDT before planting appeared to increase shoot production, and a dust of 2·5 per cent. γ BHC applied to the furrows at 1 lb. per 100 ft. of row was also effective and was recommended on account of its ease of application. It was subsequently used over the whole of the estate, with a consequent great increase in yield. Protection is thought to be adequate for two years, but the problem of protecting the subsequent ratoon crops remains.

Azab (A. K.). **Observations on the biological Races of *Stegobium paniceum* L. (Coleoptera: Anobiidae).**—*Bull. Soc. Fouad Ier Ent.* **38** pp. 59–80, 2 figs., 25 refs. Cairo, 1954.

During observations on the bionomics of *Stegobium paniceum* (L.), the existence of two strains or races with markedly different rates of development was established, one from Europe developing on cereals and cereal products and the other from the United States, developing solely on cured and uncured stored tobacco. Though the two races were anatomically identical, there were differences between them in the size and colour of the adults, in the construction of the cocoon and in the method of oviposition. Detailed studies were carried out with the two races, which were reared on wholemeal flour and tobacco, respectively, at 23–28°C. [73·4–82·4°F.] and 70–75 per cent. relative humidity. It was confirmed that the adults do not feed. Females of the two races oviposited only in the presence of a suitable medium, those of the flour race ovipositing in flour, and those of the tobacco race in tobacco, but the latter also oviposited on cotton wool that had been contaminated with the odour of tobacco. In tests of oviposition preferences, the average numbers of eggs laid per female during ten days were 79·2 and 23·3 for pairs of the flour strain confined with flour and ground tobacco, respectively, and 56·5 and 0 for the tobacco strain confined with ground tobacco and flour, respectively. The corresponding numbers when pairs of the tobacco strain were confined with flour that had been contaminated with the odour of tobacco and with flour mixed with 10, 30 and 50 per cent. ground tobacco were 5·7, 13·5, 19·7 and 32·9, respectively.

Neither eggs laid by females of the flour race on tobacco leaf nor those laid by the same race in flour and immediately placed on tobacco hatched, whereas 90 per cent. of eggs from the same batch kept in empty phials hatched normally. The resulting larvae were placed on tobacco leaves, ground tobacco or cigarette tobacco, but all died within a few days (without feeding), as also did larvae in the second, third and fourth instars when placed on tobacco leaves. When eggs laid on tobacco by females of the flour race were removed immediately to flour, development was normal. Similar results were obtained when attempts were made to rear larvae of the tobacco race on flour, but 70 per cent. gave rise to adults when provided with a mixture of equal parts of flour and ground tobacco; none of the larvae fed on the flour. Under optimum conditions, the life-cycle of the tobacco race on tobacco lasted 6–8 weeks.

In various tests in which larvae and adults of the tobacco race were liberated at an equal distance from tobacco and flour, almost all moved towards the former, after a preliminary period of hesitation. In olfactometer

tests with newly-emerged females of the same race, tobacco was much preferred to flour or no attractant, and flour alone was usually avoided. The results of the whole work are discussed in relation to Hopkins' host-selection principle [*cf. R.A.E.*, A **10** 83], and it is suggested that further races of the Anobiid may exist.

HASSANEIN (M. H.). **Tests on the poisonous Effect on Honeybees of some Insecticides used for Plant Protection in Egypt.**—*Bull. Soc. Fouad Ier Ent.* **38** pp. 177–192, 4 figs., 26 refs. Cairo, 1954.

The literature on the toxicity of insecticides to honey bees is reviewed, and the results are given of tests carried out in Egypt to determine the toxicity to them of products widely used there against *Prodenia litura* (F.) on cotton. When dusts were applied directly to the caged bees, complete mortality was given in an hour by a commercial preparation (cotton dust) containing 10 per cent. DDT, 25 per cent. of a product containing 3 per cent. γ BHC, 40 per cent. sulphur and 25 per cent. inert ingredients, in two hours by 10 per cent. DDT alone and in 48 hours by 5 per cent. DDT. DDT gave 54·1 per cent. mortality in five days at 2·5 per cent. and 3·84–7·5 per cent. mortality in the same period at 0·1–1 per cent., as compared with 4·48 per cent. for no treatment. It is concluded that dusts containing up to 1 per cent. DDT could safely be applied to cotton during flowering. Dusts containing 0·5, 0·65 and 2·5 per cent. γ BHC gave complete kill within an hour. When the bees were exposed to dusted surfaces, cotton dust, 10 per cent. DDT or 0·65 or 2·5 per cent. γ BHC gave complete kill in an hour, and when they were exposed to spray deposits on glass, 1 and 0·5 per cent. DDT gave complete kill in 1 and 2 days, and mortality in five days reached 19·6 and 72·2 per cent. for 0·1 and 0·25 per cent. DDT, respectively. Deposits from sprays containing 0·0032 and 0·0065 per cent. γ BHC gave complete mortality in 10–20 minutes, and those from sprays of 0·0004 and 0·0016 per cent. γ BHC gave 9·1 and 47 per cent. mortality in five days, as compared with 4·9 per cent. for no treatment.

When the insecticides were mixed with sugar syrup and fed to individual bees, DDT gave complete kill in 1, 2 and 4 days at 48, 42 and 24 mmg. per bee, respectively, and 60·9, 26·4 and 21 per cent. mortality in five days at 12, 6 and 3 mmg. BHC, containing 90 per cent. γ isomer, gave complete kill in one day at 0·4 mmg. per bee, 87·4 per cent. mortality in four days at 0·25 mmg. and 78·4, 50 and 40 per cent. mortality in five days at 0·1, 0·05 and 0·025 mmg., respectively. Calcium arsenate gave 100 per cent. kill in 1 and 3 days at 42 and 36 mmg., 71·4 per cent. in four days at 24 mmg., and 52, 24·9 and 14·3 per cent. in five days at 12, 6 and 3 mmg., respectively. When hungry bees were left on dusted cotton flowers for five minutes, removed to cages and observed for mortality on the following day, cotton dust, 10 per cent. DDT and 0·65 and 2·5 per cent. γ BHC all gave complete kill, a mixture of lime, sulphur and calcium arsenate gave 83·2 per cent. mortality (and complete mortality by the third day), calcium arsenate alone gave about 75 per cent., and 7·5 per cent. DDT gave about 73 per cent. DDT at 2·5 and 5 per cent. gave 0 and about 9 per cent. mortality, respectively.

In a final test, bees were collected from a cotton field after foraging on dusted flowers for known periods, caged, and observed for mortality on the following day. All were dead after exposure for about one minute to flowers treated with cotton dust, and 10 per cent. DDT and 0·65 and 2·5 per cent. γ BHC also gave complete kill. Of those foraging on flowers dusted with 5 per cent. DDT, 14·3 per cent. were dead on the following day, and the corresponding percentages for the mixture of lime, sulphur and calcium

arsenate and calcium arsenate alone were 43·5 and 31·8, respectively, complete kill resulting after three days. Mortality among bees taken from untreated flowers did not exceed 10·3 per cent.

Abou-Raya (A. K.). *Bruchidius alfierii* **Pic, a biologic Race of** *Bruchidius trifolii* **Motsch. (Coleoptera: Bruchidae).**—*Bull. Soc. Fouad Ier Ent.* **38** pp. 193–203, 9 refs. Cairo, 1954.

Bruchids found infesting the seeds of Egyptian clover (*Trifolium alexandrinum*) in Egypt have been identified as *Bruchus* (*Bruchidius*) *alfierii* Pic and *B.* (*B.*) *trifolii* Motsch. *B. alfierii* was described as having reddish legs and antennae, and *B. trifolii* as having black ones. Since little was known of their bionomics, investigations were carried out in the laboratory in 1943–45 and 1952–53. Adults were obtained either by sweeping standing crops or from stored seeds; up to 64 per cent. of the seeds from Lower Egypt were infested, but seeds from Upper Egypt were only lightly damaged. In breeding experiments, individuals of each colour gave rise to progeny of their own and the other colour, intermediate forms were also produced, and all forms were interfertile.

Only adults of the blackish form were present in the stored seeds during autumn and winter. They were not sexually mature and did not become so until they had fed in the field in spring. In the laboratory they survived for up to three months after leaving the seeds. Adults of this form were collected in spring by sweeping various crops and other plants in flower. They were first taken on clover in March, when flowering begins, but adults collected before the end of that month did not oviposit when transferred to the laboratory. Individuals of both forms were taken by sweeping in June, when the clover crop was almost mature, and both were produced by blackish individuals taken in April and allowed to breed in the stored seeds. Adults of the reddish form paired and the females oviposited shortly after emergence, the adults surviving for a maximum of ten days and the life-cycle lasting about a month. The percentage of blackish individuals in the progeny of reddish ones increased with the approach of autumn, and only blackish individuals were present after October. Adults of the blackish form produced in summer and autumn in stored seeds were sexually immature and did not reproduce in the laboratory.

It is concluded from the investigations that *B. alfierii* is a biological race of *B. trifolii*.

Kolkaila (A. M.) & Soliman (A. A.). **A Study of the Banana Aphid,** *Pentalonia nigronervosa* **Coq. (Hemiptera Homoptera: Aphididae).**—*Bull. Soc. Fouad Ier Ent.* **38** pp. 231–250, 11 figs., 14 refs. Cairo, 1954.

Bunchy-top disease is common on banana in Egypt, and as little was known of *Pentalonia nigronervosa* Coq., the Aphid that transmits the causal virus [*cf. R.A.E.*, A **29** 149], its food-plants and distribution are reviewed from the literature, the apterous and alate females and the nymphs, the only forms observed [*cf. loc. cit.*], are described, and an account is given of observations carried out near Alexandria. In Egypt, the Aphid is present only on cultivated banana, and it survived for only a few days on *Canna* and *Strelitzia*. Activity was greatest during the winter, the optimum conditions for development (20–22°C. [68–71·6°F.] and 60–70 per cent. relative humidity) prevailing in the rainy months of December and January. During this period, the Aphids left the leaf bases and migrated to the upper parts of the plants, especially the bases of the petioles and the heart leaves,

and all the plants examined were found to be infested. The virus is disseminated mainly by the alates, which chiefly appear during the rainy period. In late March and April, when the temperature rises and humidity decreases, few alates were observed, and the Aphids migrated to the leaf bases, where they remained hidden throughout the summer. Some alates continue to appear in summer, however, and these are responsible for the infections that develop in September and October. In studies on the mechanism of feeding [*cf.* **39** 64], the stylet sheaths were observed to pass between the cells to the phloem, but some ended in other tissues.

Pollard (D. G.). **A Note on the Biology of *Calidea duodecimpunctata* (Fabr.) in the Sudan (Hemiptera-Heteroptera: Pentatomidae).**—*Bull. Soc. Fouad Ier Ent.* **38** pp. 291–295, 2 refs. Cairo, 1954.

Calidea duodecimpunctata (F.) is present throughout the Gezira area of the Sudan, usually in small numbers, on cotton and other plants, but a local outbreak of this Pentatomid on vegetables occurred in July–August 1950 near Wad Medani. Lists are given of the plants on which it has been observed and of the places from which it has been recorded in the Sudan, and all stages are briefly described. During rearing in the laboratory at 25–33°C. [77–91·4°F.] on *Phyllanthus niruri* and *Corchorus olitorius*, the eggs were laid in groups of 18–40, averaging 25, on the stem, petiole or leaf, and hatched in 2–4 days, with an average of 2·5. The nymphs fed on the upper leaf surfaces and became full-fed in about 26 days. The adults feed on foliage and on cotton bolls, but are not injurious.

El-Sawaf (S. K.). **A Contribution to the Host-selection-principle as applied to *Bruchus* (*Callosobruchus*) *maculatus* F. (Coleoptera: Bruchidae).**—*Bull. Soc. Fouad Ier Ent.* **38** pp. 297–303, 4 refs. Cairo, 1954. **The Effect of Weevily-seeds on the Oviposition of *Bruchus* (*Callosobruchus*) *maculatus* F. (Coleoptera: Bruchidae).**—*T. c.* pp. 311–313, 3 refs.

In the first paper, the author records experiments carried out in view of published evidence that Hopkins' host-selection principle does not apply to *Bruchus maculatus* F. [*cf. R.A.E.*, A **15** 399; **41** 414]. Petri dishes were divided into eight compartments by low strips of cardboard, and four, separated from each other by smaller, empty compartments, were filled with 25 cowpeas, 25 chickpeas (*Cicer arietinum*), 20 beans (*Phaseolus vulgaris*) and 40 peas (*Pisum sativum*), respectively. A male and a female of *B. maculatus* that had emerged less than half an hour previously were introduced into each of the empty compartments, and the dishes were covered with muslin and kept in the dark at 25°C. [77°F.] and 75 per cent. relative humidity. After four days, the eggs laid on each group of seeds were counted, and the insects were transferred to fresh dishes similarly arranged. A further count of eggs laid was made when all the beetles had died. In the first test, the insects were of a strain reared for ten generations on cowpeas, and the numbers of eggs laid by four females on cowpeas, beans, peas and chickpeas averaged 117·5, 71·3, 23·9 and 0·2, respectively, during the first four days and 11·1, 9, 7·9 and 0, respectively, during the remainder of life. In the second test, the beetles were of a strain reared on chickpeas for six generations, and the corresponding averages were 130, 77·2, 21·3 and 0·7 during the first period and 15·3, 11·3, 8·2 and 0·1 during the second. The tests confirmed that the host-selection principle does not apply to *B. maculatus* and that the attractiveness of cowpeas for the ovipositing females is more marked during the first few days of life [*cf.* **41** 414].

In the second paper, a test is recorded in which groups of two males and two females of *B. maculatus*, all newly emerged, were confined with 20 sound cowpeas, 20 cowpeas that had been previously infested, or 20 sound cowpeas that had been artificially punctured. The average numbers of eggs laid per two females on the three types of seed were 106, 152·6 and 105·5, respectively. It is concluded that the characteristic scent of the previously infested cowpeas may have served as a stimulant to oviposition.

Bichara (I.). **Damage caused to Cotton Leaves by** *Tanymecus musculus* **Fahrs. (Coleoptera: Curculionidae).**—*Bull. Soc. Fouad Ier Ent.* **38** pp. 315–317, 2 figs. Cairo, 1954.

Tanymecus musculus Fhs., which is of no economic importance in Egypt, was observed attacking cotton there for the first time in 1937 and again in 1939, over small areas in Egypt in Girga Province, about 300 miles south of Cairo. The damage was caused by the adults, which hid in the soil by day and fed on the leaves at night.

Bichara (I.). **A casual Stem-borer of Cotton Plant (Hymenoptera: Sphecoidea-Crabronidae).**—*Bull. Soc. Fouad Ier Ent.* **38** pp. 319–321, 4 figs. Cairo, 1954.

Two instances are recorded of *Ectemnius* (*Crabro*) *laevigatus* De Stefani tunnelling in the stems of cotton in Egypt. Such damage is extremely rare.

Azab (A. K.) & Kira (M. T.). *Dacus ciliatus* **Loew, an important new Pest attacking Cucurbitaceous Plants in Upper-Egypt (Diptera: Trypaneidae).**—*Bull. Soc. Fouad Ier Ent.* **38** pp. 379–382, 2 figs. Cairo, 1954.

Dacus ciliatus Lw., which had not previously been recorded from Egypt, was found causing severe damage to melons in Upper Egypt and cucumbers at Giza in 1953. It is thought to have been present for some years. Observations showed that the eggs of the fruit-fly were laid in groups of 3–9 in the cucurbit fruits. The larvae fed on the pulp and seeds and pupated in the soil, or very rarely in the fruit; the pupal stage lasted 9–15 days, but was markedly affected by low temperature. There were several generations a year.

Lizer y Trelles (C. A.) & Vergani (A. R.). **Comportamiento del amoníaco como cebo atractivo de la mosca de los frutos** (*Ceratitis capitata*). [The Behaviour of Ammonia as an attractive Bait for *C. capitata*.]—*Rev. Fac. Agron.* **13** pt. 3 pp. 439–446, 4 graphs. Buenos Aires, 1955. (With a Summary in English.)

Ceratitis capitata (Wied.) is causing increasing damage to fruits in Argentina [*cf. R.A.E.*, A **41** 254] and in view of severe attacks in orchards near Buenos Aires in recent years, studies were made to determine whether ammonia could be substituted for the wine vinegar widely used in bait-traps, in order to reduce the cost of control. Bait-traps containing 2 per cent. commercial ammonia in water or 25 per cent. wine vinegar were suspended in a mixed orchard from 12th April until 30th June of the following year, the liquids being renewed weekly. Wine vinegar attracted 78 per cent. of all the adults taken, and it is concluded that ammonia is not an effective attractant, but females formed 66 and 76 per cent. of the totals taken in

traps containing wine vinegar and ammonia, respectively. No adults were taken between 1st July and 30th November.

Griot (M.). **Observaciones sobre algunos parásitos de** *Ceroplastes grandis* **Hempel.** [Observations on natural Enemies of *C. grandis.*]—*Rev. Fac. Agron.* **13** pt. 3 pp. 491–504, 26 figs., 18 refs. Buenos Aires, 1955. (With a Summary in English.)

Ceroplastes grandis Hemp., which is widely distributed throughout Argentina, attacks various shade trees, including *Platanus* and *Jacaranda*, in the avenues of Buenos Aires. It has only one generation a year, and in 1950, most of the females oviposited between 2nd and 13th February and most of the eggs hatched between 28th February and 14th March. No males were observed. The eggs were destroyed by a Eupelmid of which the eggs and larvae are described, and also by *Leucopis* (*Leucopina*) *ceroplastophaga* (Blanch.). Adults of the Eupelmid emerged between early January and mid-February. The eggs were deposited among those of the host and hatched in 5–8 days, and the larvae became full-fed in about 20 days, overwintered, and pupated at the end of December. The adults of *L. ceroplastophaga*, of which the immature stages are briefly described, emerged in mid-November, and the eggs were laid at the edge of the waxy covering of the host. The larvae hatched in 4–8 days but appeared not to feed until early February, when eggs of the Coccid became available. They often destroyed all but a small proportion of these, became full-fed in 15–20 days and pupated at the beginning of March, the pupae overwintering. Larvae of *Euzophera homoeosomella* Zell. were predacious on the adult and immature Coccids, the eggs being deposited on or near these. The larvae hatched in about five days, and the complete life-cycle lasted 30–40 days. There appeared to be four generations a year, and winter was probably passed in the larval stage. Larvae of *E. homoeosomella* were themselves parasitised by *Ephialtes* (*Calliephialtes*) *argentinus* (Blanch.), and *Apanteles haywardi* Blanch. The Coccid was also attacked by the Syrphid, *Salpingogaster flukei* Curran.

Fagundes (N. B.), Addór (A. A.), Gonçalves (C. R.) & Schuller (K.). **Nova forma de aplicação do paradiclorobenzeno no combate à saúva.** [A new Method of applying p-Dichlorobenzene against Leaf-cutting Ants.]—*Bol. fitossanit.* **6** (1952–55) no. 1–2 pp. 11–19, 4 figs. Rio de Janeiro, 1955.

Though preliminary experiments near Rio de Janeiro on the control of leaf-cutting ants had shown that the introduction of p-dichlorobenzene crystals at about 1·5 oz. per sq. yard of nest surface gave good control, several applications were usually necessary, and other formulations of the product were sought. In order to improve vaporisation, the crystals were dissolved in petrol at the rate of about 5 lb. per 2 gals., and the solution, which was prepared immediately before use, was applied through the entrance holes at about 1·5 fl. oz. per sq. yard of surface. Complete extinction of the colonies resulted from a single application. In view of the high cost of the petrol, however, a mixture of p-dichlorobenzene, calcium carbonate and talc (7:1:2), finely ground together and sieved, was used as a dust, the inert ingredients preventing the crystals from agglomerating. In tests against *Atta sexdens rubropilosa* Forel in 1954–55, this was either forced into the nests by means of a hand pump or poured into the holes through a funnel; only one application was made, the rate being 0·45–0·9 oz.

dust per sq. yard. Excavation of the nests 2–3 months later showed that all colonies treated at 0·6 and 0·75 oz. per sq. yard by means of the pump, the dust being applied through one hole in each area of about a sq. yard, were extinct. Applications with the pump at the same rates but through holes more widely spaced gave inferior results, as also did pump treatments at 0·45 oz. and all funnel treatments.

Gonçalves (C. R.), Portella (L. N.) & Macêdo (A.). **O gafanhoto no nordeste do Brasil.** [The Locust in north-eastern Brazil.]—*Bol. fitossanit.* **6** (1952–55) no. 1–2 pp. 27–33. Rio de Janeiro, 1955.

Schistocerca cancellata (Serv.) is present in the extreme north-east of Brazil in the solitary phase, tending towards phase *transiens congregans*, and does not form migrating swarms, such as occur in southern Brazil and Argentina [*cf. R.A.E.*, A **39** 137; **41** 217]. The eggs hatch with the onset of the winter rains, and the hoppers feed on the sprouting vegetation but are reduced in numbers during the dry summer months, when food is scarce. If the rains begin early enough, two generations are produced in the year. Little damage is usually caused, but unusual increases in numbers occurred in 1942–48 and 1951–55, with consequent crop losses, particularly of cotton. In 1955, numerous foci of developing hoppers were found in early March, in Paraíba and neighbouring States, and control measures, including dusting with BHC against both adults and hoppers, were adopted, with considerable success.

d'Araujo e Silva (A. G.). **Seis novas brocas da laranjeira. I. Broca das pontas.** [Six new Borers on Orange. I. Tip Borers.]—*Bol. fitossanit.* **6** (1952–55) no. 1–2 pp. 35–44, 8 figs. Rio de Janeiro, 1955.

The Cerambycid, *Hexoplon ctenostomoides* Thoms., and the Lamiid, *Phoebe phoebe* (Lep. & Serv.), are recorded damaging orange and the former also lemon in Rio de Janeiro. Their original descriptions are quoted, the adults of both species are described and notes are given on the damage caused by the larvae, which mine the twigs downwards from the tip, causing the leaves to dry up. Pupation occurs within the gallery, and the adults appeared in October–December.

Leiderman (L.). **Estudos da ação de modernos inseticidas orgânicos sôbre a lagarta dos milharais, *Laphygma frugiperda* (Abbot & Smith, 1797) em milho (Lepidoptera, Noctuidae).** [Studies on the Action of modern organic Insecticides on *L. frugiperda*.]—*Arq. Inst. biol.* **22** (1955) pp. 1–12, 2 refs. São Paulo, 1956. (With a Summary in English.)

In view of previous results in tests against *Laphygma frugiperda* (J. E. Smith) on maize in São Paulo [*R.A.E.*, A **42** 314], experiments were carried out in 1953 in which the insecticides were used at greater concentrations. Those compared were 0·06 and 0·08 per cent. aldrin or isodrin, 0·3, 0·4 and 0·5 per cent. chlordane or DDT, 0·4 and 0·5 per cent. toxaphene or methoxy-DDT (methoxychlor) and 0·06, 0·08 and 0·1 per cent. dieldrin, endrin, parathion or γ BHC (as lindane) in sprays, all from wettable powders except endrin, which was in an emulsion concentrate, and 2 per cent. aldrin or dieldrin, 5 and 10 per cent. chlordane, DDT or methoxy-DDT, 1 and 2 per cent. γ BHC or parathion and 10 per cent. toxaphene in dusts. Treatments were applied once, when the maize was 6–10 ins. high, sprays in four tests at about 40·5 gals. per acre and dusts in three tests at

about 18 lb. per acre. Counts of infested plants were made 5 and 20 days later, and control percentages were calculated by a formula already noticed [**26** 82]. The average percentage of plants infested before treatment ranged from 29·1 to 69·4 in the sprayed plots and from 38 to 65·8 in the dusted ones. In the sprays, the lowest concentrations that gave complete control in five days in at least one of the tests were 0·08 for isodrin, parathion, γ BHC, dieldrin and endrin and 0·4 for DDT, chlordane, methoxy-DDT and toxaphene, and control was still complete on the 20th day for all except parathion and γ BHC. In the dusts, none of the treatments gave complete control in five days, and only 10 per cent. toxaphene did so in 20 days. Over 90 per cent. control was given in five days by parathion at 1 per cent., dieldrin, chlordane at 5 per cent., methoxy-DDT at 10 per cent., and toxaphene. After 20 days, the control percentage for 1 per cent. parathion and γ BHC were 95·1 and 95·7, respectively.

May (A. W. S.) & Kleinschmidt (R. P.). **Some native Parasites of Dacinae (fam. Trypetidae) in Queensland.**—*Qd J. agric. Sci.* **11** no. 3 pp. 107–113, 14 refs. Brisbane, 1954; also as *Bull. Div. Pl. Ind. Dep. Agric. Qd* no. 79, 7 pp., 14 refs. Brisbane [1954].

A list is given of two species of *Bracon* (both unidentified) and seven of *Opius* reared from Trypetids in Queensland, showing their hosts, the plants attacked by the latter, and the locality and date of the record, followed by a list of the Trypetids showing the species by which they were parasitised. It is concluded that native parasites of fruit-flies are of little importance in Queensland.

Day (M. F.). **The Mechanism of the Transmission of Potato Leaf Roll Virus by Aphids.**—*Aust. J. biol. Sci.* **8** no. 4 pp. 498–513, 30 refs. Melbourne, 1955.

In view of conflicting reports as to the occurrence of a latent period in the Aphid vector during transmission of the potato leaf-roll virus [*cf. R.A.E.*, A **15** 509; **19** 459; **32** 260; **40** 271; **43** 273; **44** 281] and the recent suggestion that the occurrence or absence of a latent period is indicative of the mode of transmission [**44** 267], investigations on the transmission of this virus were carried out in the laboratory in Australia. The test insects were usually apterae of *Myzus persicae* (Sulz.) from a stock maintained for four years on *Datura stramonium* or *Solanum melongena*, and the test plants were *Physalis floridana*. It was found that infective Aphids retained the virus during ecdysis, were rendered infective by the injection into them of haemolymph from examples that had fed on infected plants for two weeks, and remained infective for at least eight days, during which time they were able to infect many successive plants. In comparative tests, *Macrosiphum solanifolii* (Ashm.) (*euphorbiae*, auct.) transmitted the virus with difficulty and only when *Datura tatula* was used as the source and test plant. Previously starved *Myzus persicae* did not become infective when allowed to feed through a plastic membrane on a solution of the virus prepared from infected *P. floridana*, possibly because too little was present, but the virus was isolated from Aphids that had fed on infected potato or *P. floridana*, and injection of it into uninfected Aphids rendered them infective. Some evidence of multiplication of the virus within the vector was obtained when examples of *M. persicae* that had fed for 1–6 hours on infected *D. tatula* and were subsequently transferred to an immune food-plant were removed from the latter at daily intervals for four or more days

and placed singly on uninfected *P. floridana*; in general, the percentage of healthy plants infected increased with the period on the immune food-plant for up to three days.

As these results were consistent with the view that potato leaf-roll is ingested by the vector prior to transmission [*cf.* **44** 267], an attempt was made to obtain further evidence regarding the latent period. No transmission resulted in numerous tests in which both acquisition and inoculation feeding periods lasted five minutes or in another experiment in which they lasted 10–120 minutes each, though 17 of 22 test plants became infected when they lasted 24 hours. Other experiments are recorded from which it is concluded that when *M. persicae* feeds on a plant containing a low concentration of virus there is generally a latent period of about 20 hours at 25°C. [77°F.] between the acquisition feed and a successful inoculation feed. When the vector feeds on a source of high virus concentration, occasional transmission is obtained with short acquisition and inoculation feeds of about two hours. The percentage of transmissions obtained under these conditions was much lower, however, than that reported in the United States [**43** 273; **44** 281]. In attempts to determine whether different strains of Aphids or virus were responsible, no difference in efficiency was noted between the progeny of apterae reared from a stock of field-collected alates, and differing themselves in efficiency, and virus strains isolated from infected potatoes from widely separated parts of Australia did not differ in their vector relations.

The relevance of these results to the mechanism of transmission of viruses by insects is discussed, and it is suggested that the occurrence of a latent period in a virus vector is indicative of the passage of the virus from the midgut into the salivary glands by way of the haemocoele and multiplication of the virus in the vector.

GUNTHER (F. A.) & BLINN (R. C.). **Analysis of Insecticides and Acaricides. A Treatise on Sampling, Isolation, and Determination including Residue Methods.**— *Chem. Anal.* **6** 9¼ × 6 ins., xi + 696 pp., 126 figs., many refs. New York, N.Y. & London, Interscience Publ., Inc., 1955. Price £5 12*s.* or $14.

This handbook on the quantitative analysis of the residues left, chiefly on plant parts and in the soil, by organic and inorganic insecticides and acaricides applied against agricultural pests and of technical-grade materials and formulated products is divided into three sections. The first (pp. 3–171) contains discussions of the factors that influence the size and selection of suitable unit samples, their storage and preparation for analysis, the types of analytical methods available, the evaluation of techniques, the interpretation of data, methods of keeping records, and the safety precautions to be observed in analytical laboratories, and the second (pp. 175–182) deals in a similar manner with sampling practices and procedures for the quantitative determination of the major components in technical-grade materials, formulated products and mixtures. The third section (pp. 185–614) includes detailed descriptions of equipment and methods used in collecting and measuring samples, the isolation of deposits and residues, and their preparation for analysis, but the greater part of it (pp. 260–614) is devoted to instructions for the analysis by various methods of the composition of insecticidal materials and preparations, drawn largely from the literature, and of their residues, based mainly on the authors' experience. Detailed ultra-violet and infra-red spectra for numerous insecticides are given in appendices.

Müller (P.). Ed. **DDT. Das Insektizid Dichlordiphenyltrichloräthan und seine Bedeutung. The Insecticide Dichlorodiphenyltrichloroethane and its Significance. Vol. I.**—*Lehrb. Monogr. Geb. exakt. Wiss., chem. Reihe* **9** 9½ × 6¾ ins., 299 pp., illus., many refs. Basle & Stuttgart, Birkhäuser Verlag, 1955. Price *Sw. Fr.* or *DM.* 37.50.

This is the first of a proposed series of three volumes dealing with the development and uses of DDT, to which various authors were invited to contribute, and contains an introduction and four critical reviews in German, to all of which summaries in English are provided, and one review in English, with a German summary.

The introduction (pp. 11–26, 1 graph, 2¼ pp. refs.) is by Müller, who describes the history of the discovery and development of DDT as an insecticide.

In **Physik und Chemie des DDT-Insektizides** [Physics and Chemistry of DDT] (pp. 27–89, 3 figs., 7 pp. refs.), Müller discusses in three chapters, each with its own bibliography, the physical properties of DDT, the determination of p,p'DDT in samples of the technical product, and the chemistry of DDT, its isomers and analogues, and related products, with a note on the relation between chemical constitution and toxicity to insects.

In **The Mode of Action of DDT** (pp. 91–111, 137 refs.), V. B. Wigglesworth reviews the physical factors concerned in the pick-up of DDT by an insect, its entry through the cuticle and distribution after entering the body, the symptoms caused, the action of DDT on the nervous system, on enzymes and on metabolism, factors influencing its effectiveness, the metabolism of DDT and acquired resistance to it in various insects, and the relation of the chemical structure to the insecticidal activity of DDT.

In **Erfahrungsbericht über die Verwendung von DDT im Vorratsschutz** [Experiments on the Use of DDT for the Protection of Stored Products] (pp. 113–143, 8 figs., 32 refs.), E. Bernfus discusses the importance and habits of grain-infesting insects and describes the use in Austria of a dust known as Geigy 33, which contains 10 per cent. DDT. This gives complete control of insect infestation when mixed with infested grain at the rate of 0·1 per cent. by weight, and the latter is subsequently mixed 1:10 with untreated grain, so that the content of pure DDT in the grain received at the mill is only 2 parts per million. The respective advantages of this treatment and of fumigation are briefly discussed. He also records experiments showing that treatment of malting barley with Geigy 33 does not result in the presence of DDT in the beer brewed from it, and describes large-scale methods of mixing the dust with grain.

In **Die Anwendung von DDT-Insektiziden im Textilschutz** [The Use of DDT for the Protection of Textiles] (pp. 145–195, 26 figs., 101 refs.), O. Wälchli reviews the bionomics of the principal pests of wool, techniques by which insects are used to test the effectiveness of moth-proofing processes, and the ways in which DDT is applied for the protection of woollen textiles. These are as dusts for application to stored materials, as solutions and emulsified solutions for the impregnation of cloth and as aerosols and smokes for use in storage premises. The effectiveness of DDT against the various pests concerned is discussed at some length.

In **Die Anwendung von DDT in der Forstwirtschaft** [The Use of DDT in Forestry] (pp. 197–299, 16 figs., 284 refs.), V. Butovitsch reviews in four chapters the susceptibility of forest pests to DDT, experiments in various countries against insects in forests, arranged according to the part of the tree attacked, the various formulations and methods of application that can be employed, and the effects of DDT on the whole fauna of the forest.

Bradbury (F. R.) & Whitaker (W. O.). **The systemic Action of Benzene Hexachloride in Plants: quantitative Measurements.**—*J. Sci. Fd Agric.* **7** no. 4 pp. 248–253, 1 graph, 14 refs. London, 1956.

Plants are known to absorb γ BHC and thus become toxic to insects feeding on them [*cf. R.A.E.*, A **43** 180, etc.], and the insecticide is absorbed from the vapour phase by grain [*cf.* **42** 332]. Insecticidal seed dressings are widely applied to cereals, and as their use is being extended to other crops, a quantitative study of the absorption of γ BHC by seeds and plants was carried out to elucidate their mode of action. Seeds of wheat, oats, rape, flax and linseed were exposed to saturated BHC vapour for 1–6 weeks at 25°C. [77°F.], washed with chloroform, ground and extracted with chloroform for six hours. The γ BHC on the outside of the seeds was determined from the chloroform used for washing, and that inside from the extracts. The results showed that the compound readily penetrated the seeds from the vapour. A steady concentration was rapidly attained in the outer, presumably waxy, layer, whereas that inside increased gradually over a longer period. The outer cuticular layer was apparently in a steady state of equilibrium with the surrounding vapour, replacing the insecticide as it was lost to the inner tissues, and it was found to act as an actual bar to penetration, since the rate and extent of absorption were both increased when it was removed. The amount of insecticide absorbed, both in the outer layer and throughout the seed, varied with the plant, linseed absorbing most (120 mmg. per gm. seed) and wheat and flax seed least (30 mmg.).

When the roots of young wheat seedlings were immersed in aqueous solutions of γ BHC and the insecticide in the plants and solutions was determined by chloroform extraction after various periods, it was found that the plants removed very large quantities of γ BHC from the solutions in comparison with the weight of seed used (up to 100 mmg. per gm. seed in 13 days). The amount of insecticide in the solution decreased steadily as the experiment progressed, whereas that in the seedling increased unevenly and less rapidly, the total recovered from plant and solution falling as the experiment proceeded. Similar tests with seedlings grown for 14 days in solutions of γ BHC labelled with radioactive carbon (^{14}C) showed that the plants did not convert the insecticide into water-soluble products, so that the loss of insecticide must be ascribed to evaporation from the plant of either the unchanged insecticide or a volatile decomposition product.

The results indicate that virtually all the γ BHC applied in a seed dressing may be absorbed and that the main effects of such treatment are systemic.

Bhambhani (H. J.). **Determination of Fumigants. XXIII. The Recovery of Hydrogen Cyanide from fumigated Insects.**—*J. Sci. Fd Agric.* **7** no. 4 pp. 276–281, 5 figs., 12 refs. London, 1956.

The following is the author's summary of this paper, which forms part of a series [*cf. R.A.E.*, A **41** 312, etc.]. The recovery of hydrogen cyanide from fumigated insects (*Calandra granaria* (L.) and *C. oryzae* (L.)) depends on the pH of the solution used to hydrolyse cyanohydrins formed in the insects. A considerable increase in the amount of recoverable fumigant is found when the insects are ground before distillation. When care is taken to recover all the fumigant possible, the discrepancy between sorption and recovery becomes scarcely measurable for short periods of fumigation. Discrepancies attributed to metabolism by other workers [*cf.* **40** 3–4] seem likely to be associated with incomplete recovery.

Joubert (C. J.) & Walters (S. S.). **A preliminary Report on the Control of the Argentine Ant (*Iridomyrmex humilis*) by applying Insecticides to the Soil.**—*Fmg in S. Afr.* **30** no. 350 pp. 269–272. Pretoria. 1955.

In 1952, experiments were begun in South Africa on the value of soil treatments in vineyards for the control of *Iridomyrmex humilis* (Mayr), which fosters *Planococcus citri* (Risso) and *Pseudococcus maritimus* (Ehrh.) and protects them from their natural enemies. The insecticides were broadcast in moist sand at the rate of about 2 lb. toxicant per acre and worked into the soil to a depth of about 3 ins. In the first test, treatments with aldrin, dieldrin and chlordane in October caused the ants to disappear within a few weeks, but reinfestation of the vines occurred in two months, the ants migrating along the trellis wires from the intervening untreated plots. In the second test, in which the same insecticides were applied to three plots on 14th April 1953, the control plot was situated at the end of the row and contact by means of trellis wires was prevented. On 7th July, when activity was normal on the untreated plot, no ants were present in the plots treated with aldrin or dieldrin and very few on that treated with chlordane. On 24th July, a few vines in each treated plot, in every case those bordering untreated land, were found to be infested, and to protect these, reeds containing a poison bait of 8 lb. syrup, 4 pints water and 20 gm. sodium arsenite were placed at the rate of one per vine round the perimeter of the treated block. The bait was renewed every 2–3 weeks until April 1954 and used again from November 1954. There was a very marked decrease in the ant population in the treated plots and an increase in the untreated plot after the baits were first exposed, and the vines in treated plots remained almost free from ants. In February 1955, however, one colony was found established in the soil of the aldrin-treated plot. Laboratory tests carried out in March 1955 with samples of soil from the treated plots showed that ants confined with them all died in 48 hours, while those confined with untreated soil were still alive after four days. The treated plots showed decreasing mealybug population in the spring of 1953 and were free from infestation in January 1954 and February 1955, whereas untreated vines were normally infested. It is pointed out that the poison bait placed round the perimeter is a useful supplementary measure ensuring general reductions in the ant population. The three insecticides were about equally effective, and chlordane is shown to be the cheapest. It is best applied in autumn, before the cover-crop is sown. Recommendations are appended for the control of colonies close to tree trunks or not in the soil, by means of sprays.

Magnin (J.). **La lutte contre les insectes nuisibles au cacaoyer dans l'ouest africain.**—*Agron. trop.* **9** no. 4 pp. 467–478, 11 refs. Nogent-sur-Marne, 1954. (With Summaries in English and Spanish.)

The most important of the insects that attack cacao in the Ivory Coast are *Sahlbergella singularis* Hagl. and *Distantiella theobroma* (Dist.), feeding by which sometimes kills young trees in a few days. These Mirids are most numerous in November–January and cannot be eliminated, as they breed on wild plants, but they can be controlled by painting the stems with 2·5 per cent. DDT in xylene emulsion [*cf. R.A.E.*, A **37** 90; **39** 374] or as a wettable powder in suspension. Studies on residue persistence indicated that treatment should be applied three times a year, at the end of July, in November and in February–March. If the Mirids are observed on bearing plants, they can be controlled by dusting with 18–23·4 lb. 5 per cent. DDT, 10 per cent. BHC or 2·5 per cent. aldrin per acre; this treatment does not

affect pollination [*cf.* **43** 82]. *Pseudococcus njalensis* Laing and other mealybugs transmit the swollen-shoot virus disease in the Ivory Coast, and experiments in the Gold Coast on their control by the use of systemic insecticides are reviewed [*cf.* **44** 5]. The other insects mentioned are usually of little importance. *Xyleborus morstatti* Hag. is the most numerous of various Scolytids that attack cacao growing under unfavourable conditions, larvae of the Lamiids, *Tragocephala nobilis* (F.) and *T. n. chloris* Chevr., bore in the stems, chupons and roots, but can be controlled in young plants by cutting back infested branches, and *Selenothrips rubrocinctus* (Giard) infests the leaves of cacao in plantations provided with little shade.

Lavabre (E. M.). **Insectes dangereux aux cultures du cacaoyer au Cameroun.**—*Agron. trop.* **9** no. 4 pp. 479–484, 4 figs. Nogent-sur-Marne, 1954. (With Summaries in English and Spanish.)

The principal pests of cacao in the French Cameroons are the Mirids, *Sahlbergella singularis* Hagl., *Distantiella theobroma* (Dist.) and *Helopeltis bergrothi* Reut. The first is the most numerous and injurious, and its feeding weakens the plants and allows the entry of fungi, particularly *Calonectria rigidiuscula*, and the combined attack causes withering of the young branches. For control, these should be cut back, the bark of young trees should be painted with DDT [*cf.* preceding abstract] and larger trees should be sprayed with 2·4 lb. technical BHC per 100 gals. The Mirid was shown to be particularly numerous where the plants were exposed to light [*cf. R.A.E.*, A **41** 238], and the maintenance of an even distribution of shade to retard breeding is an important method of control. *D. theobroma*, which has similar habits, and *H. bergrothi*, which chiefly attacks the pods, are of less importance. Of the other insects present, *Achaea catocaloides* Gn. sometimes defoliates cacao over large areas; but it can be controlled by dusting with DDT when the larvae are seen descending from the shade trees. The Pentatomid, *Atelocera serrata* (F.), blackens and kills the tips of the shoots, but can be controlled by hand collection or by spraying with DDT or BHC. The trees are also attacked by various borers, of which *Tragocephala nobilis chloris* Chevr. is the most numerous.

Renaud (R.). **Les maladies à virus du cacaoyer de l'ouest africain.**—*Agron. trop.* **9** no. 5 pp. 516–543, 13 figs., 3 pp. refs. Nogent-sur-Marne, 1954. (With Summaries in English and Spanish.)

The author describes the distribution of the swollen-shoot disease of cacao in West Africa with particular reference to the Ivory Coast, where it appears to be present to some degree in more than half the cacao-producing areas. Two main strains of the virus are present, the more important at Kongodia and the other at Sankadiokro [*cf. R.A.E.*, A **39** 288], and *Pseudococcus njalensis* Laing is by far the most important of the mealybug vectors, *Planococcus* (*Pseudococcus*) *citri* (Risso) being of little importance and *Ferrisiana virgata* (Ckll.) rare. As strains of the virus are found in several wild plants, it is thought that the disease may be a combination of various endemic virus diseases affecting indigenous plants [*cf.* **43** 79], which probably became epidemic when American cacao was introduced. Cacao trees can be protected by inoculation of attenuated strains [*cf.* **44** 48, etc.], but the protection is effective against only single strains and may be of short duration [*cf.* **40** 363]. The vectors have been successfully controlled with systemic insecticides in tests in the Gold Coast [*cf.* **43** 81; **44** 5], but such treatment is not economic.

Risbec (J.). **Les parasites de** *Pseudococcus njalensis* **Laing et de** *Pseudococcus bingervillensis* **Magnin.**—*Agron. trop.* **10** no. 2 pp. 231–237, 2 figs., 5 refs. Nogent-sur-Marne, 1955. (With Summaries in English and Spanish.)

Magnin (J.). **Description d'un nouveau Pseudococcidae de Côte d'Ivoire.**—*T. c.* pp. 238–240, 1 fig., 4 refs. (With Summaries in English and Spanish.)

In the second of these papers, the author describes the adult female of *Pseudococcus bingervillensis*, sp. n., which closely resembles that of *P. njalensis* Laing, and gives characters of the spermatozoa of both species. *P. bingervillensis* was taken on *Alchornea cordifolia*, a common plant in the lower Ivory Coast, and is of no economic importance. In tests, it did not attack cacao. *P. bingervillensis*, *P. njalensis* and *Tylococcus westwoodi* Strickl. often occur on the same plant, and all three mealybugs are visited by the ant, *Oecophylla longinoda* (Latr.). The parasites reared from the first two mealybugs are listed in the first paper. They comprised *Anagyrus kivuensis* Comp., *Tropidophryne africana* Comp., *Neodiscodes martinii* Comp. (of which *Coccophoctonus abengouroui* Risbec [*R.A.E.*, A **39** 289] is a synonym), *Cheiloneurus carinatus* Comp. and *Allotropa magnini*, sp. n., from *P. njalensis*, and *Anagyrus amoenus* Comp., another species of *Anagyrus* thought to be *A. bugandaensis* Comp., and *Protyndarichus ivorensis*, sp. n., from *Pseudococcus bingervillensis*. The adults of both sexes of the two new species are described.

Husson (R.). **Cas de polyédrose chez le géométride** *Ennomos quercinaria* **Hufn. et considérations générales sur les polyédroses.**—*Rev. Path. vég.* **33** (1954) fasc. 4 pp. 208–221, 14 figs., 52 refs. Paris, 1955.

Large numbers of larvae of *Ennomos quercinaria* (Hfn.), which had caused severe damage to forest trees near Saarbrücken since 1952 [*cf.* *R.A.E.*, A **43** 366], were observed in June 1954 to be dying from a polyhedral disease of the nuclear type [*cf.* **43** 303]. The author reviews the literature on polyhedral diseases in insects and on the nature and classification of viruses, and proposes the name *Borrelina saraviensis* for the virus observed.

Jover (H.). **Contribution à l'étude biologique des Coléoptères xylophages de Basse Côte-d'Ivoire.**—*Rev. Path. vég.* **33** (1954) fasc. 4 pp. 222–231, 4 refs. Paris, 1955.

Most of the Bostrychids dealt with in this paper, which is complementary to one already noticed [*R.A.E.*, A **43** 333], infest living or felled trees in the lower Ivory Coast, and notes are given on their local distribution, habits and natural enemies, with records of the trees attacked. The only one recorded from sawn wood is *Minthea rugicollis* (Wlk.). *Rhizopertha dominica* (F.) rarely infests wood, but is a pest of stored cereals.

Bodenheimer (F. S.) & Neumark (S.). **The Israel Pine** *Matsucoccus* (*Matsucoccus josephi* **nov. spec.**).—9¾ × 6¾ ins., 122 + xvii pp., 4 pls., 40 figs., many refs. Jerusalem, K. Sepher Ltd., 1955. (With a Summary in Hebrew.)

Aleppo pine (*Pinus halepensis*) has been extensively used for afforestation of eroded hillsides in Israel and was little affected by insect pests until

1944–46. when young plantations suffered severe infestation by a Coccid here described by Bodenheimer & I. Harpaz as *Matsucoccus josephi*, sp. n. In addition to descriptions of all stages, information is given on the course of the outbreak, the local distribution and bionomics of *M. josephi*, the damage caused by it and by secondary pests on trees weakened by it, its predators and other insects associated with it, and control measures. Damage was first observed in young plantations near Mt. Carmel in 1935–36, when the tops of the trees showed extensive withering and some 60–70 per cent. of the trees had recently died. The later outbreak occurred on and to the south and east of Mt. Carmel and at two places farther south into which the Coccid was introduced on nursery stock. Infestation spread still further after 1950, and, at the time of writing, every nursery in the Mt. Carmel area was heavily infested and young plantations were liable to severe attack. Relict forests of *P. halepensis* occur on Mt. Carmel and in Upper Galilee, to the north of it, and *M. josephi* was present in virtually all of them; no infestation was observed in new plantations or nurseries in Upper Galilee.

Observations showed that *M. josephi* usually had six generations a year, some of which overlap, the duration of development ranging from 45 days in summer to 90 in winter. The females were mobile for up to three days before oviposition, which took place under bark scales, in crevices in the bark or at the base of the needle clusters and continues for six days; the females laid an average of about 340 eggs each. The nymphs mostly migrated to the base of the youngest twigs or needles, but settled under the bark or even on the crown roots or inflorescences. Males were plentiful in spring, autumn and winter but scarce in summer. The population reached peaks in spring and autumn and fell rapidly in late spring, principally, it is thought, because the osmotic pressure in the plants becomes high as a result of climatic conditions and food is thus less readily available, but also because of the activity of predators, which were abundant at that season. Wind appears to be the main natural agent of dissemination. Although *P. halepensis* is the normal food-plant, development was equally rapid when eggs were transferred to seedlings of *P. brutia*, and a plantation of *P. pinea* established in 1940 near an infested stand of *P. halepensis* was recently found to be infested. The main predators were *Chrysopa carnea* Steph., *Anthocoris nemorum* (L.) and the mite, *Anystis baccarum* (L.), but they do not prevent large populations of *M. josephi* from developing. Ants carried large numbers of mobile females to their nests and thus reduced oviposition. Coccinellids afforded negligible control, and no parasites or diseases were observed.

Damage by *M. josephi* is most conspicuous in stands less than ten years old. The new twigs, first on the lower and later on the upper branches, become twisted and eventually die and break off in the wind; new shoots formed beneath them wither, and the main branches die from the top downwards. Initial mortality among trees up to five years of age is high, but provided that 30–40 per cent. survive, it corresponds only to natural thinning, for which it was previously mistaken. Some heavily damaged trees recovered, but most succumb. Damage to the wood of older trees is limited to the periphery and is unimportant; it is more severe in young trees, but timber from *P. halepensis* is of inferior quality and the damage to it probably of little consequence. *M. josephi* is not therefore considered a pest of primary economic importance. The Scolytid, *Ips* (*Pityogenes*) *quadridens calcaratus* (Dej.), attacks trees 3–7 years old that have been weakened by *M. josephi* and destroys them within a few weeks.

Soil conditions, the density of the trees, and interplanting with other species appeared to have little effect on infestation, and pruning infested trees

hindered their recovery. The use of insecticides is not practicable, owing to the hilly nature of the infested territory, but the liberation of *C. carnea* appeared promising as a means of reducing initial damage in young plantations, and a technique for the mass production of the eggs was developed. The recommended measures comprise the immediate destruction of all infested nursery stock, which should not be used even within the infested areas, and the avoidance for new plantations of sites near infested groves. Damage by *I. q. calcaratus* is usually insignificant, but during outbreaks, when many trees are weakened by *M. josephi*, those showing numerous entrance holes of *Ips* should be felled and burnt before the emergence of the next generation.

MARTELLI (M.). **La nottua minatrice del carciofo in Sardegna.** [*Hydroecia xanthenes* attacking Artichokes in Sardinia.]—*Studi sassaresi* Sez. III *Ann. Fac. Agr. Sassari* **2** pp. 23–49, 3 pls., 11 figs., 30 refs. Sassari, 1954.

The author describes all stages of *Hydroecia xanthenes* (Germ.), which causes severe damage to globe artichokes (*Cynara*) in Sardinia, and reviews its systematic position and the literature on its bionomics and control [*cf. R.A.E.*, A **28** 277, etc.]. Losses range up to 55 per cent. near Cagliari and 25 per cent. near Sassari and are greatest where the plants are renewed only every 2–3 years. Observations showed that there was only one generation a year, the first adults appearing in late July in 1951, when the spring and summer were dry and hot, and towards the end of September in 1953, when they had been cool and wet. Maximum numbers were reached in late September and October. The females usually laid at least 400–500 eggs each, mostly in groups near the root collar or in dry leaf axils. The eggs laid by unfertilised females did not hatch; those laid by fertilised individuals hatched in about 20 days, and larvae were present on the plants in large numbers in October–November. They fed in the inflorescences, or on the young leaves of the main shoots if these had not appeared, or mined in the leaf veins, in either case penetrating into the stem. All had entered the stems by April. They moved down towards the roots in May–July, feeding on the pith, and pupated in the base of the stem, the pupal stage lasting 18–23 days. Only one larva was found per stem during this period. The destruction of infested leaves and stems is the control measure chiefly used, but Boselli found an emulsified solution of 0·25 per cent. DDT, with an adhesive, effective against the newly hatched larvae, before the inflorescences had opened.

MARTELLI (M.). **Appunti etologici su due Depressariini (Lepidoptera Gelechiidae) viventi a spese del carciofo.** [Notes on the Bionomics of two Depressariini attacking Artichokes.]—*Studi sassaresi* Sez. III *Ann. Fac. Agr. Sassari* **2** pp. 50–59, 5 figs., 18 refs. Sassari, 1954.

The insects that attack artichoke (*Cynara*) include *Depressaria subpropinquella* Stnt. and *D. erinaceella* Stgr. (*Schistodepressaria sardoniella* (Rebel)), and notes are given on their bionomics, based on observations in Emilia (northern Italy) and Sardinia, respectively. Larvae of *D. subpropinquella* were observed from the first ten days of April and fed on the lower surface of the leaves for about 40 days in a silken shelter close to the main vein. When full-fed, about 10th–15th May, they folded over a portion of the leaf and pupated in it, adults emerging after about 21–27 days. The first adults appeared at the end of May, and maximum numbers were

reached in the first ten days of June. The number of generations a year is unknown. Parasites reared from *D. subpropinquella* in Emilia comprise the Tachinids, *Actia crassicornis* (Mg.) and *Nemorilla floralis* (Fall.), and two Ichneumonids, *Itoplectis* (*Pimpla*) *maculator* (F.) and a species of *Campoplex* (*Omorgus*) close to *lugubrinus* (Hlmgr.). Control measures are quoted from the literature [*R.A.E.*, A **25** 68].

D. crinaceella had only one generation a year. The larvae first fed on the shoots and mined in the main veins of the leaves, causing them to wither, and then, between late January and mid-February, entered the inflorescences and fed on the involucral bracts. They became full-fed towards the end of April and pupated in the soil. In the laboratory, the first adults from field-collected material emerged on 17th and 28th July and 20th June in 1951, 1952 and 1953, respectively. The adults survive until September–October, and it is thought that the eggs are laid in autumn.

Walrave (J.). **Proeven met systemische insecticiden. II.** [Experiments with Systemic Insecticides. II.]—*Tijdschr. PlZiekt.* **60** pt. 5 pp. 205–220, 9 graphs, 9 refs. Wageningen, 1954. (With a Summary in English.)

In further tests with Pestox 3 [which contains schradan] and Systox [diethyl 2-(ethylmercapto)ethyl thiophosphate (demeton)] in Holland [*cf. R.A.E.*, A **43** 60], the translocation of the insecticides in bean and potato plants was investigated. The materials used were the same as before, and unless otherwise stated the concentration of active ingredient was 0·2 per cent. When the leaves of bean plants (*Phaseolus vulgaris*) in the two-leaf stage were sprayed with either material on one or other surface, Aphids died about as quickly on the untreated as on the treated surfaces [*cf. loc. cit.*], and when Systox was applied to young potato leaves by brushing it over the half of the leaf nearest the stalk, that furthest from it, or that on one side of the midrib and both halves were infested with *Macrosiphum solanifolii* (Ashm.) (*euphorbiae*, auct.) 18 hours later, mortality on the untreated halves reached about 85, 30 and 70 per cent., respectively, in 36 hours, and that on the treated areas rose to about 95 per cent. within 24 hours. When one of the leaves of bean plants in the two-leaf stage was treated with Systox, the mortality of *Myzus persicae* (Sulz.) placed on the untreated leaf 19 hours later reached about 40 per cent. in a further 40 hours, whereas when Pestox was used, examples of *Aphis fabae* Scop. placed on the untreated leaf after 24 hours suffered less than 5 per cent. mortality in the same time. No translocation was observed between cotyledons and true leaves of *P. vulgaris* when either was treated with Pestox, and none even when the concentration applied to the first or second true leaf was increased to 0·3 per cent. When Systox was applied under the same conditions, translocation was slight. However, when broad beans (*Vicia faba*) having eight pairs of leaves were used as the test plants and either the lower or upper three pairs of leaves were treated with Pestox at 0·4 per cent. active ingredient, mortality of *A. fabae* placed on the untreated leaves 17 hours later reached 85 per cent. within about 6 days. In further tests, the mortality of *M. persicae* on the untreated upper parts of potato plants about five weeks old, the lower parts of which had been sprayed seven hours previously with Systox at 0·1 per cent. active ingredient, reached about 40 per cent. in 90 hours, whereas when Pestox was used and the Aphids were placed on the untreated parts after 24 hours, the corresponding percentage was only about 18. When the lower or upper parts of young, growing potato plants were sprayed with Systox at 0·15 per cent. active ingredient, the mortality of *Macrosiphum solanifolii* placed on the

untreated parts 69 hours later rose to about 85 and 70, respectively, in 24 hours, but when examples of *M.* (*Aulacorthum*) *solani* (Kalt.) were placed on full-grown plants 89 hours after spraying, the corresponding figures were only about 40 and 35, respectively. When examples of *Myzus persicae* were placed on the untreated lower parts of still older plants sprayed 71 hours previously, mortality reached only 30 per cent. in 24 hours.

In a final test, in which Systox was applied to the lower or upper parts of normal plants and of plants of which 2 ins. of stem at mid-length had been covered with cotton wool and treated with boiling water to kill the living tissues, the mortality percentages of *M. persicae* placed on the untreated parts of the normal and (in brackets) the prepared plants 46 hours after spraying were 96 (86) and 64 (42), respectively, and in view of these results it is concluded that translocation is effected through the xylem.

Ankersmit (G. W.) & van Nieukerken (H. D.). **De invloed van temperatuur en wind op het vliegen van de koolzaadsnuitkever** *Ceuthorrhynchus assimilis* **Payk.** [The Influence of Temperature and Wind on Flight of *C. assimilis*.]—*Tijdschr. PlZiekt.* **60** pt. 5 pp. 230–239, 3 graphs, 3 refs. Wageningen, 1954. (With a Summary in English.)

In the course of investigations on the flight activity of *Ceuthorrhynchus assimilis* (Payk.), carried out in three localities in Holland in 1953, a shallow trap-dish with a slanting edge and the bottom painted yellow [*cf. R.A.E.*, A **39** 359] was filled with a solution of 0·2 per cent. nicotine and placed at the edge of a rape-field harvested the previous year, to catch weevils emerging from hibernation, and a similar one was placed near a field about to blossom. Catches in the two dishes indicated peaks of flight towards the end of April and about mid-May in both fields, and during June and again in mid-July in the current season's field, when the numbers of weevils caught increased owing to the fall of the rape blossom and the consequent greater relative attractiveness of the dish. Further investigations in June, July and August showed weevils in the dishes on 93 per cent. of the days on which these were examined when the maximum temperature was 20–30°C. [68–86°F.] and the minimum wind speed less than 1 Beaufort, on progressively fewer days as maximum temperature fell or minimum wind speed rose, and on none when the maximum temperature was only 10–15°C. [50–59°F.] and the minimum wind speed 3–4 Beaufort or more. Catches by means of nets and adhesive traps gave similar results.

Ehlers (M.). **Weiteres zur Bekämpfung der Zwiebelfliege.** [Further Investigations on the Control of the Onion Fly.]—*Anz. Schädlingsk.* **28** pt. 4 pp. 57–60, 12 refs. Berlin, 1955.

In tests in 1954 near Berlin, onion seeds were treated with seven proprietary insecticidal dusts against the onion fly [*Hylemyia antiqua* (Mg.)] and sown 2–5 days later, between 12th and 26th April. Two of the dusts contained 50 and 80 per cent. DDT and were applied at 2:5 and 1:5, respectively, by weight of seed, and another contained 90 per cent. dieldrin and was applied at 1:20 or 1:10. The seeds were moistened with water, starch being added in the case of the 50 per cent. DDT dust, and then mixed with the dusts, dried in air, and subsequently stored in sealed tubes until sowing. Laboratory tests showed that the percentages of seeds that germinated after storage for 3 days and (in brackets) 8½ months were 23 (0), 79 (3), 77 (44) and 88 (27) for the four treatments, respectively, and 86 (73) for no treatment. Estimates of plant growth were made between 15th and 22nd June and expressed on a scale ranging from −5 for complete

inhibition to 0 for growth equal to that in the controls and positive values for improved growth. The values averaged −1·1 and −0·2 for the two DDT dusts, respectively, and 0·5 for dieldrin at both rates of application. Estimates of attack by *H. antiqua* were made on 9th and 10th July and expressed on a scale ranging from 0 for no sign of attack to 5 for attack on all plants, and the corresponding values averaged 0·13 and 0·54 for the two DDT dusts, 0 for dieldrin at both rates of application and 2·38 for the controls. Counts 10–14 days after harvesting (between late September and early November) showed that the numbers of sound onions from the seeds treated with DDT or dieldrin or left untreated represented about 33, 61 and 9 per cent., respectively, of the numbers of viable seeds sown, the yield being slightly higher for the smaller quantity of dieldrin than for the larger. In similar tests, a dust containing 80 per cent. lindane [almost pure γ BHC] and two others containing 50 or 90 per cent. of a mixture of lindane and DDT considerably reduced germination, and a dust containing only 20 per cent. lindane did not give satisfactory protection against infestation.

Beck (S. D.). **Nutrition of the European Corn Borer, *Pyrausta nubilalis* (Hbn.). III. An unidentified Dietary Factor required for Larval Growth.**—*J. gen. Physiol.* **36** no. 3 pp. 317–325, 1 graph, 6 refs. Baltimore, Md., 1953.

The following is virtually the author's summary of this third part of a series [*cf. R.A.E.*, A **39** 440; **40** 161]. The larva of *Pyrausta nubilalis* (Hb.) was shown to require a dietary source of one or more unidentified factors contained in maize leaves, grass juice concentrate and certain other plant materials. The required factor or factors are termed the maize leaf factor. The maize leaf factor does not appear to be identical with any of the known B vitamins, or with ascorbic acid, sodium nucleate, citrovorum factor, or carnitine. The maize leaf factor is heat-stable, acid-stable, water-soluble, and dialysable.

Wallis (R. L.). **Ecological Studies on the Potato Psyllid as a Pest of Potatoes.**—*Tech. Bull. U.S. Dep. Agric.* no. 1107, [1+] 25 pp., 8 figs., 2 maps, 21 refs. Washington, D.C., 1955.

The following is virtually the author's summary. An ecological study of *Paratrioza cockerelli* (Šulc), which causes Psyllid yellows of potato and tomato plants in the United States, was made in 1939–52 to determine the cause of outbreaks. *P. cockerelli* occurs in North and South Dakota, Nebraska, Kansas, Oklahoma and Texas and all States west of these except Washington and Oregon. High humidity apparently prevents it from moving further to the east. Its food-plants are confined almost entirely to the Solanaceae [*cf. R.A.E.*, A **40** 92]. The only other plants on which it is known to breed are field bindweed (*Convolvulus arvensis*), morning-glory (*Ipomoea purpurea*) and sweet potato.

Psyllid yellows appears first on plants at the edge of the field and progresses towards the centre. The first symptoms in potato are an upward curling of the basal portions of leaflets near the top of the plants and a purpling of the curled portions. As the disease advances, the tops of the plants become dwarfed and the affected leaves become thick and leathery and eventually turn yellow or purplish. Underground, there is a heavy set of small tubers close to the main stem. These tubers mature early, sprout, and produce secondary stolons, which may set additional tubers. The tubers are usually unmarketable.

P. cockerelli overwinters in Texas and southern New Mexico, feeding mostly on wild *Lycium*. Development almost stops during January because of low temperatures, but is resumed in February. In the spring, the adults spread to the north or north-west with the prevailing winds, and move from the spring breeding areas in Texas and New Mexico into the potato-growing areas of Colorado, Wyoming and Nebraska. This movement occurs during May and June, when temperatures in the potato-growing areas are between 60 and 70°F. [*cf.* **37** 335]. The greatest movement is in June, reaching a peak about 1st July. Psyllid populations in the plains decrease rapidly in July, when temperatures average above 70°, and there is a corresponding increase in the mountainous areas, where temperatures are lower. Summer populations of Psyllids in the potato-growing areas are also affected by the size of the host plants when maximum temperatures occur. Large plants, such as early potatoes, protect Psyllids from high temperatures in July.

In potato-growing areas, the ornamental plant, matrimony vine (*Lycium halimifolium*), and piles of sprouting cull potatoes are important sources of Psyllid infestation for cultivated crops [*cf.* **36** 144]. Much benefit can be obtained by destroying these [*cf.* **38** 162]. Matrimony vine can be easily killed by spraying with 2,4-D[2,4-dichlorophenoxyacetic acid]. Sprouts in cull piles can be prevented by scattering the tubers when dumped, so that they are in layers of not more than one in depth. Groundcherries (*Physalis* spp.) and buffalo-bur (*Solanum rostratum*), which are abundant in the potato-growing areas, are not important sources of infestation, since they do not begin growth until potato is available.

A pre-season survey each year of adult Psyllid populations on non-economic food-plants will indicate the expected population on potatoes for the growing season. Such a survey will save up to ten million bushels of potatoes in the Psyllid-infested area in outbreak years and will spare the farmer the expense of treating with insecticides when light attacks are indicated.

PAPERS NOTICED BY TITLE ONLY.

TALHOUK (A. S.). **A List of Insects found on Plants of economic Importance in Syria.**—*Bull. Soc. Fouad Ier Ent.* **38** pp. 305–309, 4 refs. Cairo, 1954.

CEBALLOS (G.). *Nemeritis robustus* **una nueva especie española de Campoplexini (Ichneum. Ophion.), parásito de la** *Dioryctria splendidella*. [*Nemeritis robusta*, sp.n., parasitising *Dioryctria splendidella* (H.-S.) on Pine in Spain.]—*Eos* **31** pt. 3–4 pp. 341–343, 3 figs. Madrid, 1955.

LEIDERMAN (L.). **O combate das lagartas de** *Heliothis obsoleta* **(Fabr., 1793) (Lepidoptera, Noctuidae) em espigas de milho com modernos inseticidas orgânicos.** [The Control of *H. zea* (Boddie) (*obsoleta* (F.)) in Maize Ears in Brazil with modern organic Insecticides.]—*Arq. Inst. biol.* **22** (1955) pp. 13–22, 3 refs. São Paulo, 1956. (With a Summary in English.) [For abstract of almost identical paper see *R.A.E.*, A **43** 253.]

THOMAS (W. D. E.). **A sedimentation Method for the Determination of the effective Particle Size Distribution of DDT dispersible Powders.**—*J. Sci. Fd Agric.* 7 no. 4 pp. 270–276, 4 figs., 11 refs. London, 1956.